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Service

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Draft Environmental Impact Statement

Bozeman Municipal Watershed

Bozeman Ranger District
Gallatin National Forest
Gallatin County, MT.

Mystic Lake circa 1880

Mystic Lake circa 1980

Bozeman Municipal Watershed Project
Draft Environmental Impact Statement
Gallatin County, Montana

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Abstract: This Draft Environmental Impact Statement responds to the desire of the Gallatin National Forest to implement fuel reduction activities in the portion of the National Forest that is the City of Bozeman Municipal Watershed. The impact statement documents the analysis of the proposal to implement these activities and four alternatives to the proposal. The activities proposed for fuel reduction are thinning and partial harvest in mature timber stands, thinning in small diameter timber stands, prescribed burning in these stands following thinning and harvest, and broadcast burning in less dense stands of timber. Alternatives to the Proposed Action are variations on the amounts and location of these activities and variations in harvest methods; tractor harvest, cable harvest, or helicopter harvest. Alternative 5 has been identified as the Preferred Alternative.

Reviewers should provide the Forest Service with their comments during the review period of the Draft Environmental Impact Statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decision making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewers' position and contentions. Comments on the draft environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Send Comments to: **Jim Devitt Gallatin National Forest**
PO Box 130 Bozeman, MT 59771

Date Comments Must Be Received: **October 31, 2007**

SUMMARY

The Gallatin National Forest proposes to implement fuels reduction activities to reduce the potential for severe and extensive wildfire in the Bozeman Creek and Hyalite Creek drainages. The area affected by the proposal includes the City of Bozeman Municipal Watershed. This action is proposed because of the fuel conditions in the drainages which consists of forested stands of generally mature timber. Analyses and fire risk assessments of the area have concluded there is a high risk to the integrity of the watershed should there be severe and extensive wildfire. This would affect the quality of the water for Bozeman's domestic use, it would cause a safety concern for the recreating public and firefighters, and a wildfire started on the National Forest could enter into the wild land, urban interface to the north of the forest boundary.

The Forest Service has worked with the City of Bozeman and other interest groups to develop the issues and alternatives for this Draft Environmental Impact Statement. The alternatives address the significant issues by varying the types of fuel reduction treatments and the amount of acreage treated. These activities include partial thinning in mature stands, thinning of excess standing fuels in small diameter regenerated timber, and broadcast burning in less dense forest. Each of these alternatives accomplishes the purpose of the project in different ways and each has differing effects on resources such as water quality, scenic quality, fisheries and soils.

The Forest Service has identified Alternative 5 as the Preferred Alternative.

Chapter 1 of this document discusses the purpose and need for the project and gives a more detailed discussion of the background. Chapter 2 describes the alternatives in detail and gives a summary comparison of the alternatives. Chapter 3 is where you will find the analysis and disclosure of effects for all the issues.

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CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

Document Structure

The Forest Service has prepared this Draft Environmental Impact Statement in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Draft Environmental Impact Statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action, the implementation of fuels reduction activities, and alternatives to the proposed action. The document is organized into four chapters:

- *Chapter 1. Purpose and Need for Action:* The chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also discusses how the Forest Service informed the public of the proposal.
- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences*: This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource issue.
- *Chapter 4. Consultation and Coordination:* This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- *Appendices:* The appendices provide more information to support the analyses presented in the environmental impact statement.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record.

Background

Since 2003 three separate landscape scale forest condition analyses have been completed within the study area, including one conducted by the Forest Service. The "Sourdough Creek Watershed Assessment", (Bozeman Watershed Council, Bozeman, 2004) was a study contracted by a private interest group that provided baseline resource information and identified conditions which limit watershed integrity and function within the Bozeman Creek watershed. This analysis showed that the Bozeman Creek municipal watershed is "at risk of high severity fire and fuel reduction measures may be necessary to protect water quality from extensive sediment delivery". The Bozeman Watershed

Council has recommended the Forest Service reduce the heavy fuel loading through vegetative fuel treatments, including prescribed fire, timber harvest and thinning.

The City of Bozeman contracted with Western Groundwater Services to complete a Source Water Protection Plan focusing on the water supply sources for Bozeman's public water system. The report studied the potential impacts that could occur to these sources and identifies activities the city could use to protect these source waters. It concluded that wildfire is the highest potential threat to the Hyalite Creek and Bozeman Creek watersheds. The report states, "a significant wildfire in one drainage would likely enter the other resulting in a complete shutdown of the City of Bozeman water treatment plant during runoff events" (City of Bozeman Source Water Protection Plan, Western Groundwater Services, Bozeman, 2004).

The Gallatin National Forest conducted a watershed analysis and risk assessment for the entire 50,000 acre Bozeman Municipal Watershed (Bozeman Creek drainage and Hyalite Creek drainage)in 2003. Initial assessment indicated that both Bozeman Creek and Hyalite Creek should be analyzed together because of their proximity and similar vegetative conditions. Fire simulation models showed that a large fire started in either Bozeman Creek or Hyalite Creek could easily burn into the adjacent drainage, resulting in simultaneous impact on both major sources of city water supply. Like other studies, a key finding of this assessment was that burned areas could become significant sources of sediment and ash delivery to streams. Major rainfall or runoff events following a wildfire could result in heavy sediment loads that would exceed the capacity of the city's water treatment plant. Under such conditions, which could last from days to weeks and persist for several years following a major fire event, the city could be incapable of meeting water demand, resulting in a critical shortfall of the local water supply. Another conclusion of the Forest Service assessment was that a major wildfire within the municipal watershed would pose significant danger to both firefighters and the recreating public due to limited road access in these areas. These findings helped Forest Service managers determine that both Hyalite and Bozeman Creek drainages were high priority, full suppression areas in the event of a wildfire (USFS, Bozeman Municipal Watershed Risk Assessment. Bozeman, MT, 2003).

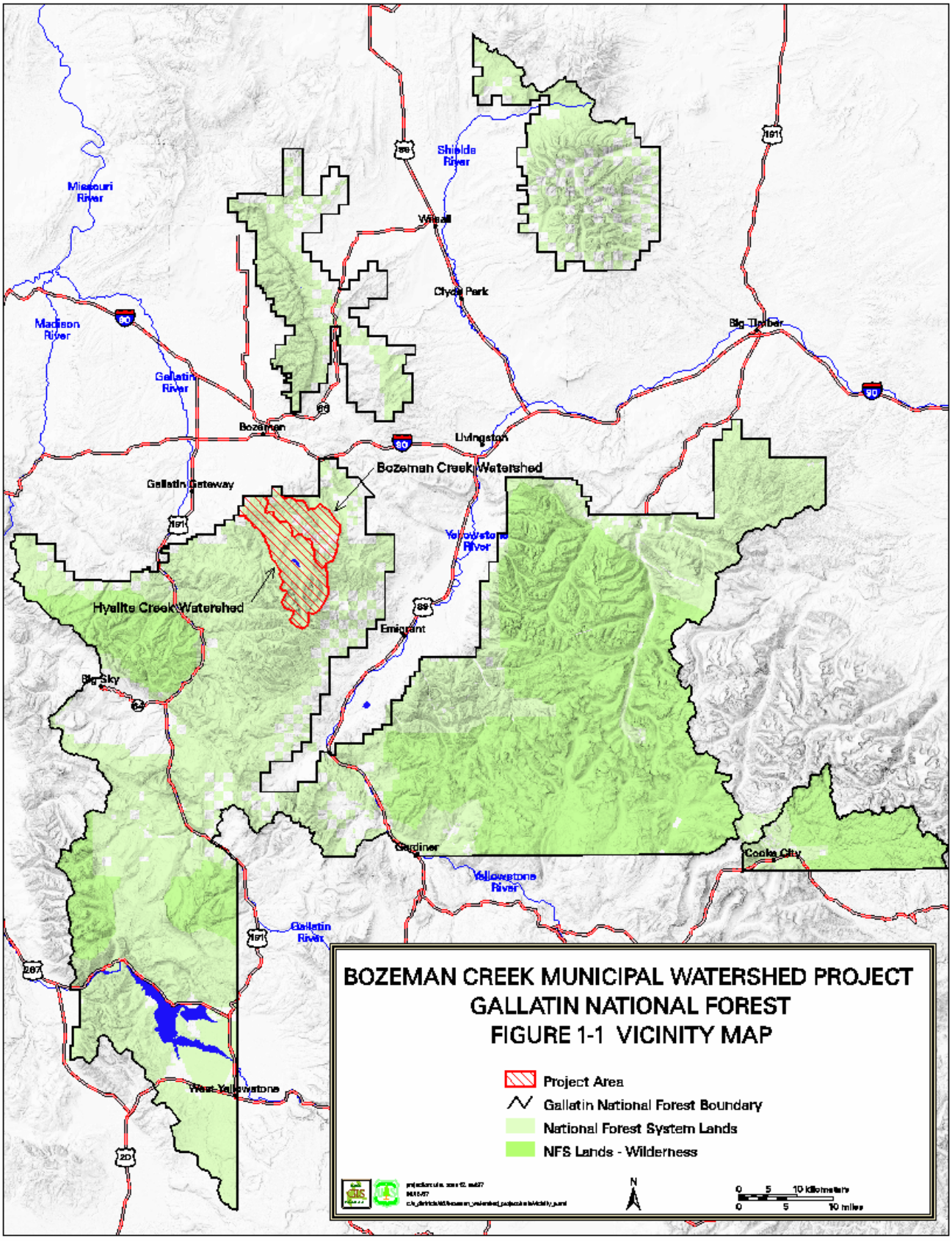
These studies, coupled with discussions involving local and state government officials, prompted Gallatin National Forest personnel to begin working with key stakeholders to find solutions to the serious fuels situation and to protect the long term municipal watershed health. Watershed sedimentation models were used to identify the limitations on the areas of potential treatment that could occur in the drainage and remain within Forest Plan standards.

The Bozeman Ranger District has worked with the following groups and organizations to discuss the assessment findings and potential activities relative to the identified watershed risks:

- Bozeman Watershed Council
- Bozeman City Commissioners
- Bozeman City Staff

- Montana Department of Natural Resources
- Sourdough & Rae Fire Department
- Gallatin County Commissioners

Based on these findings and collaborative discussions, the Bozeman Ranger District proposes to implement a fuels reduction project within the Bozeman Creek and Hyalite drainages and to begin restoration of the fire-adapted ecosystem.


Missouri River
Madison River
Gallatin River
Shields River
Wilsall
Clyde Park
Big Timber
Bozeman
Livingston
Bozeman Creek Watershed
Gallatin Gateway
Yellowstone River
Hyalite Creek Watershed
Emigrant
Big Sky
Gardiner
Cooke City
West Yellowstone
BOZEMAN CREEK MUNICIPAL WATERSHED PROJECT
GALLATIN NATIONAL FOREST
FIGURE 1-1 VICINITY MAP
Project Area
Gallatin National Forest Boundary
National Forest System Lands
NFS Lands - Wilderness
N
0 5 10 kilometers
0 5 10 miles

Restoration of Fire-Adapted Ecosystems

(Excerpted from Mimicking Nature's Fire, Restoring Fire-Prone Forests in the West, Stephan F. Arno and Carl E. Fiedler, Island Press, 2005).

"The philosophy of restoration forestry seems intuitively sensible: To the extent feasible, return the vital natural fire process and its useful effects to forests that evolved under its influence." P. 39
"The compelling case for forest restoration today parallels legendary ecologist Aldo Leopold's call for watershed restoration early in the 20th century….Although natural fires can be returned to their historical role in some secluded backcountry areas with mixed or stand replacement fire regimes, we must rely on judicious tree cutting (at least initially) and prescribed burning to restore most other fire-prone forests in the West." p.203

"Studies of fire history and forest succession coupled with decades of experience in fire behavior and suppression shows that fuels in today's forests differ markedly from those associated with the historical understory and mixed fire regimes (Arno 2000, Quigley, Haines, and Graham 1996)….Studies focused on historical understory and mixed fire regimes commonly reveal that the structure of contemporary stands contrasts with pre-1900 conditions, with many current stands being outside the range of historic variation (Agee 1993, Arno 2000, Morgan and others 1994)….The historical stand was much more likely to survive the average fire… .Absent fire, the understory trees out-compete the old trees for moisture and nutrients. The old trees loose vigor and often succumb to insects, disease, or the stress imposed by burning in even low- to moderate-intensity fires (Arno, Scott, and Hartwell 1995, Biondi 1996)." Pp.31-32

"Today, the concept of restoration forestry is broadly accepted by federal land managers but is scarcely known to the public. Restoration forestry in its many forms is being implemented in diverse forest types in on different ownerships across the West….Present knowledge is sufficient to carry us beyond today's mostly small, isolated projects toward larger treatment areas and landscape-scale strategies. However, despite deteriorating forest conditions and unprecedented fire hazard across millions of acres, the proposition that restoration forestry is an ecological and practical imperative has not gone unchallenged." P.12

Current Vegetative Condition

The Bozeman Municipal Watershed analysis area can be characterized as a landscape dominated by steep canyons and timbered slopes in the lower reaches of Bozeman and Hyalite creeks. Dominant vegetative types communities include Douglas-fir and lodgepole pine. There are also minor amounts of aspen, some grassland and sagebrush sites, and grassland/meadows where Douglas-fir is encroaching. Douglas-fir generally occurs on the warmer, drier aspects (south-west), and lodgepole pine on the cooler, moister aspects (north to east). Many of the middle to upper slopes that are cooler and

moister have a mixture of Douglas-fir and lodgepole pine, as well as Englemann spruce and small amounts of sub-alpine fir.

The entire Hyalite and Bozeman Creeks area is approximately 91 percent forested with lodgepole pine, Douglas-fir, subalpine fir, Englemann spruce and whitebark pine. The general area is composed of cool to moist Douglas-fir habitat types (about 18 percent) on the lower elevations facing south and west, with cooler and moister subalpine fir habitat types at the higher elevations or on the lower elevations facing north and east (about 82 percent). The most common habitat types include: subalpine fir/twinflower, subalpine fir/grouse whortleberry, subalpine fir-whitebark pine/grouse whortleberry and whitebark pine

Forested stands are predominantly single-storied, but two-storied and multi-storied stands also occur across the project area. Stand composition ranges from a mix of Douglas-fir and lodgepole pine (about 5 percent), pure Douglas-fir (26%), lodgepole pine (about 44 percent) to a mix of subalpine fir, Englemann spruce and lodgepole pine (15%). Whitebark pine stands are found at the highest elevations (and comprise about 11 percent of the forested area). About 88 percent of the stands within the entire general area are moderately to well stocked with cover from 40% to 90%.

Basic timber stand information for the project area is based on intensive and quick plot stand examinations and mathematical regression estimates. Tree densities range from 120 to 4400 trees per acre. On steep, north and northwest-facing slopes, stand densities are at the higher end of the range with 200 to 500 trees per acre greater than 5 inches diameter at breast height. On the more gentle slopes, overall densities are highly variable, but densities in trees greater than 5 inches diameter at breast height are between 200 and 300 trees per acre. Average stand diameters range from 1 to 15 inches with the majority between 6 and 9 inches at breast height. Tree heights typically average less than 70 feet. Stands in both drainages are predominantly in the mature and older age/size class (72%) with fewer stands labeled as seedling or sapling (18%) as shown by the following tables.

Table 1. Forest Size Classes In Bozeman Creek (based on 17,317 forested acres)

Successional Stages	Acres	Successional Stage Percent
Forested Grass	138	<1%
Seedling	140	<1%
Sapling	1,496	9%*
Pole	1,636	9%*
Mature	8,287	48%
Old Growth	5,620	32%

Table 2. Forest Size Classes In Hyalite Creek (based on 20,641 forested acres)

Successional Stages	Acres	Successional Stage Percent
Forested Grass	486	2%
Seedling	1,075	5%
Sapling	3,731	18%
Pole	2,329	11%
Mature	7,247	35%
Old Growth	5,773	28%

Lodgepole pine old growth is found at all elevations and aspects and a natural fire frequency that ranged from thinning fires on a 35 to 40 year frequency to stand replacing fires approximately every 150 to 200 years. Without periodic disturbances like fire, subalpine fir eventually dominates. Subalpine fir old growth is found at most elevations and aspects with a natural fire frequency similar to lodgepole. On Douglas-fir sites, natural fire frequency ranges from 35 to 45 years.

Existing Fuels Condition

Bozeman and Hyalite Creeks both drain to the north into the Gallatin Valley. The terrain is steep with many small side drainages flowing east and west into the main streams. These minor drainages create terrain features of alternating north and south aspects that repeat up and down both sides of Bozeman and Hyalite Creeks. One exception is the divide between the two drainages where the slopes are gentler as the ridge tops become more broad and rounded. Some of the terrain falls to the north toward the valley, mainly within 1 mile of the forest boundary, in the northern part of the proposal area. This complex terrain with all aspects represented (dry southerly and west to cool, moist northerly and east) results in vegetative patterns and fuel conditions that are also complex. Elevations in the area range from about 5300' at the mouths of the canyons to over 7800' on the higher ridges.

The forested landscape in the proposal area was more open under historic conditions, particularly on the high energy aspects (southerly to west) that tended to burn more often. The trees were more widely spaced apart due to low intensity surface fires that tended to thin out the smaller trees (underburning). A low intensity or cool fire is one that has minimal impact on the site. This type of fire burns in surface fuels consuming only the litter, herbaceous fuels, and foliage and small twigs on woody undergrowth, but can still kill small conifers. Very little heat travels downward through the duff. The effects of this type of fire are considered ***low severity***. There were also more natural openings where more intense burning created mosaics of surface fire and crown fire. This type of burn is considered mixed or ***moderate severity***. This tends to occur more on the cool, moist sites that burn under less common drought conditions. Moderate severity fires can pose a threat to water quality.

Fire along with insects and disease has been the major ecological disturbance to the area, which is typical of western coniferous forests. Timber harvest and fire suppression have replaced wildfire as the primary disturbance process. Biomass accumulates faster than it decomposes in these dry forest types of the interior West. Fire is the ecological force that restores balance to these ecosystems. The decrease in fire occurrence in the ecosystem has disrupted the process, which adds to available fuel and changes forest structure. These changes increase the potential for uncharacteristically severe surface fires that can initiate and sustain crown fires (Graham et al, 2004, pg.35). The natural cleansing and renewal process that natural fire disturbance brings has been mostly eliminated.

The forest landscape cover type is dominated by mature forest as described above. The past 60–80 years of successful fire suppression has eliminated the low intensity underburning that occurred historically. The understory vegetation, particularly of shade tolerant tree species, flourishes in areas where it was typically killed by frequent low intensity, surface fires. Forested stands have become dense and crowded with increased ladder fuels (attached low branches close to the ground, and small trees growing up into the crowns of larger trees). Dead and dying trees and accumulated surface fuels have increased. These fuel conditions set the stage for wildland fires to potentially burn extensively as active crown fires, rather than underburns or mosaics of light surface fire and patches of crown fire.

Historically, undergrowth and ladder fuels are removed by the low intensity fire, resulting in little to no mortality in mature trees (Fischer, Wm. and B.D. Clayton, 1983, Fire Ecology of Montana, Forest Habitat types East of the Continental Divide, INT General Technical Report 141, 83pp.). Ladder fuels are an important factor in a fire reaching the crowns (tops) of the trees, which is usually fatal to an individual tree. A fire may become very severe, under the right weather conditions, such as drought and high winds. The fire may spread through the crowns at high intensity, killing entire stands (stand replacement fire), consuming large woody fuels and removing the entire duff layer over much of an area. The effects of this type of fire are considered ***high severity***. These types of fire pose a threat to water quality.

Along with the fuel conditions, weather and climate, and physical setting are the factors that influence fire behavior (Graham et al, 2004, pg.17). Fire behavior is the way fire ignites and spreads. Climate can influence when fires will occur and readily burn. The climate is cool and dry, with periods of heavy snow in winter followed by spring rains. A hot, dry period usually dominates in July and August. Average annual precipitation is 25 inches at 5300' and increases with elevation (Sourdough Creek Watershed Assessment, 2004). The fire season typically runs from late June through September. Wind is the primary weather factor affecting fire spread. The wind prevails from the west and southwest in this area. However, terrain features such as canyons can funnel and steer the winds in the direction of their flow, which could be southerly in this case. In the absence of strong prevailing winds, fire will tend to spread in the direction and speed dictated by the local diurnal conditions and topographic features. Thunderstorms and associated lightning ignite natural wildland fires in the area.

Both the Bozeman and Hyalite Creek road systems are potential evacuation corridors for the recreating public in the area should a large fire event occur. At the same time, these

roads are the access route for incoming firefighters and equipment to fight the fire. This is essentially a one-way in, one-way out situation in both drainages. The corridors are narrow and winding with few places to pull off the road or turn vehicles around. This is a safety concern because of potential traffic jams during a fire event. The situation is compounded when smoke impairs visibility and breathing; heat, flames and burnt trees falling can block passage along the corridors and potentially injure firefighters and the public.

Fire History

Fire, insects and disease have played a definite role in determining the current vegetative composition and structure. Fire in the area occurred either as localized spot fires or as large conflagrations. Based on fire history studies in adjacent areas such as the Spanish Peaks breaks (Losensky-1993), and the Squaw Creek drainage (Losensky-1993) to the southwest, there have apparently been no major fires in the area since the mid to late 1800's. One of the latest documented examples of a large, stand replacement fire event near the project area was the fire of 1881 that burned along both sides of the Gallatin Canyon from the Big Sky area to Spanish Creek. The fire was about 40 miles long in distance, and about 45,000 acres in size (Lee Metcalf Wilderness Fire Management Guidebook, 1997). Another example noted by local historians, "effects of a large fire in 1909 are still visible on Mount Ellis" (Sourdough Creek Watershed Assessment, 2004). From that time until recently, large fires have been rare partly due to increased effectiveness of fire suppression.

Fire occurrence records from 1940 to 2004 identify 64 fires in the Bozeman and Hyalite drainages (see project files). Twenty five fires were lighting caused (40%), and 39 human caused (60%). Only one fire reached Class C in size (10-100 acres) and was lightning caused. Another study in the area for the Madison Range notes that approximately 7500 acres/year should have burned historically and only 81 acres/year (average) have burned in a period 1940 through 1994 (Jones,1995). This study and the recent records for the analysis area highlights the fact that the Forest Service and the other federal wildland fire agencies have become very successful at their active fire suppression efforts, thus the term "fire exclusion". National statistics show the fire agencies are 98% successful at initial attack, therefore 2% of the wildfires cause the most problems and most expenditure of funds (National Interagency Incident Management Study, 2005, p13).

Numerous large fires have occurred on the Gallatin National Forest in recent years. The most notable near the analysis area are Bostwick (1991, 1100 ac), Fridley (2001, 26,000 ac), Purdy Creek (2001, 5,000 ac), and Big Creek (2006, 14,000 ac). These last three fires were in close proximity to the project area. The 2007 Derby Fire near Big Timber was not near the project area, but may be indicative of the severity of wildfire in extremely hot and dry conditions.

Wildland Urban Interface (WUI)

The area along the northern boundary of the project area where private land meets national forest land constitutes the wildland urban interface (WUI). There are several

homes and sub-divisions in this WUI area. Many of the homes are within one half mile from the forest boundary. Wildland Urban Interface is defined as: The line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels (Healthy Forests Restoration Act (HFRA) of 2004).

For at-risk communities that have not yet designated their WUI areas as part of a Community Wildfire Protection Plan, 2004, the HFRA has a default definition of WUI. It is an area:

- Extending ½ mile from the boundary of an at-risk community, OR
- Extending 1½ miles from the boundary when other criteria are met such as: sustained steep slopes that create potential fire behavior that endanger the at-risk community; a geographic feature that aids in creating an effective firebreak, such as a road or ridgetop, OR
- Is in Condition Class 3, OR
- Adjacent to an evacuation route. There is no distance limitation for evacuation routes.

The Community Wildfire Protection Plan (Gallatin County, 2006) for this part of Gallatin County is in draft form at this stage. It identifies the project area as being within the designated protection plan area.

Bozeman's Water Supply

Bozeman and Hyalite Creeks are the primary sources of water supply for the City of Bozeman. The City has water intake diversions on both streams near the Forest boundary with pipelines to the City Water Treatment Plant near the Bozeman Creek trailhead. Approximately 50% of the City waters supply originates from each drainage with an additional minor source in Lyman Creek in the Bridger Mountains. Water quality in both Bozeman and Hyalite Creeks is good and in compliance with water quality standards. The Montana DEQ water quality standards for both drainages are very restrictive. Bozeman Creek is designated as A-Closed and Hyalite Creek as A-1. These are non-degradation classifications with no allowable point sources of pollution and very strict controls on turbidity and non-point sources.

The City of Bozeman water treatment plant has a treatment output capacity of 15 million gallons/day with average use of about 4-5 millions gallons/day, winter use 2-4 gallons/day, and peak summer use of about 12-14 million gallons/day. The treatment plant uses a direct filtration process, including flocculation followed immediately by filtration and chlorination. Wildfire related ash deposits and sediment in Bozeman and Hyalite Creeks due to increased erosion in wildfire areas could be a major potential source of contamination to Bozeman's water supply. A large wildfire in Hyalite and Bozeman watersheds could result in short to long term loss of water supply from a few days to several weeks. The most at risk situation would be heavy rainfall within 2 years of a major wildfire. In the event of temporary closure of the treatment plant, water could be rationed from the storage tank on the east side of Bozeman with about a 3 day drinking supply if conservatively used (City of Bozeman, Water Facility

Plan 2006). In a prolonged shutdown Bozeman residents may need to use bottled water until the treatment plant resumes operation.

The City contracted with Allied Engineering for the facility plan which recommended renovations to the treatment system. The upgraded treatment plant would cost several million dollars and would not be completed for 6-8 years.

Management Direction for Restoration and Fuels Reduction

The Forest Service has current direction from the Gallatin National Forest Plan (1987), the National Fire Plan (2000), the Cohesive Strategy ("Protecting People and Sustaining Resources in Fire-Adapted Ecosystems", 2000), the Healthy Forests Initiative (2002), and Healthy Forests Restoration Act (2004) to focus attention and effort on protecting communities including municipal watersheds. However, the Forest Service only has jurisdiction for potential fuel reduction treatments on public lands in the WUI areas. The Forest Service does have responsibility to collaborate and cooperate with private landowners in the WUI. Through education and encouragement of private landowners to treat fuels on their property and make their homes fire safe, we can work towards a common goal.

The current fuel situation in the WUI, the terrain, prevailing winds, and long term drought are conditions that pose a concern for a potential wildfire to spread either from the Forest to private lands or from private lands onto the Forest. The WUI for this analysis area is along the northern boundary where private land meets National Forest Land in both Hyalite Creek and Bozeman Creek; and along the northwest boundary adjacent to the ridge between Hyalite Creek and Cottonwood Creek. The common goal would be to reduce fuels in the WUI. This will begin to reduce conditions for initiation and spread of crown fire, which will lessen the fire behavior potential of a fire spreading from or to National Forest System (NFS) lands and into the municipal watershed.

The Northern Region's Restoration and Protection Strategy (2005) starts with the National Forest Service Strategic goals and uses integrated objectives to prioritize and accomplish Regional ecosystem restoration and protection of social values at risk. The Strategy is intended to be dynamic and will be continually amended as needed to address new information, changed conditions, or changes in National priorities.

This strategy seeks to develop a common vision for addressing resource conditions across geographic areas independent of National Forest administrative boundaries. It promotes integration among programs and budgets and is used for setting priorities for investments for restoration and protection projects.

The focus of the Northern Region Restoration and Protection Strategy is to:

- Restore and maintain high value watersheds in a properly functioning condition.
- Restore and maintain wildlife habitats, including restoring more resilient vegetation conditions where appropriate, to meet ecological and social goals.

- Protect people, structures and community infra-structure (roads, bridges, and power corridors,) in and associated with the wildland-urban interface (WUI).

Some of the specific resources and values that are identified by this strategy and which are influenced by natural processes and cultural treatments include community infra-structure, watersheds and fish habitat, and municipal watersheds as sources for community water supply.

Purpose and Need for Action

The purpose of this initiative is to [insert objectives]. This action is needed, because [insert need for action in that location at this specific time]. This action responds to the goals and objectives outlined in the [X] Forest Plan, and helps move the project area towards desired conditions described in that plan ([insert reference to Forest Plan]). [Describe specific linkages to the Forest Plan if appropriate. Reference any pre-NEPA or "plan-to-project" assessments that identified the need.]

Project Purpose and Need

The purpose of this project is to help reduce the risk of severe and extensive wildfire on the National Forest lands within the municipal watershed to help maintain a high-quality, long term, water supply for Bozeman area residents through cooperative efforts with the City of Bozeman. Severe wildfire is characterized as an uncontrollable crown fire that burns entire stands of timber and threatens structures, wildlife habitat, and soil and water resources. Extent of wildfire refers to spread and size of the fire. Objectives for this project include the following:

1. Begin reducing the potential severity and extent of future wildland fires in the Bozeman Municipal Watershed by restoring and changing vegetative and fuel conditions in order to reduce the risk of excess sediment and ash reaching the municipal water treatment plant because of a wildfire.

   Need: Wildfire related ash deposits and sediment in Bozeman and Hyalite Creeks due to increased erosion in wildfire areas would be a major potential source of contamination to Bozeman's water supply. A wildfire of large and severe extent in Hyalite and Bozeman watersheds could result in short to long term loss of water supply from a few days to several weeks. The most at risk situation would be heavy rainfall within 2 years following a major wildfire. In the event of temporary closure of the treatment plant, water could be rationed from the storage tank on the east side of Bozeman with about a 3 day drinking supply if conservatively used. In a prolonged shutdown Bozeman residents may need to use bottled water until the treatment plant resumes operation.

2. Treat vegetation and fuel conditions along road corridors that will provide for firefighter and public safety by beginning to modify potential fire behavior.

Need: Both the Bozeman and Hyalite Creek road systems are potential evacuation corridors for the recreating public in the area should a large fire event occur. At the same time, these roads are the access route for incoming firefighters and equipment to fight the fire. This is essentially a one-way in, one-way out situation in both drainages. The corridors are narrow and winding with few places to pull off the road or turn vehicles around. Up to 2000 vehicles per day may be entering Hyalite Canyon on a busy summer weekend day with the potential for traffic during a fire. The need is to provide more time for safe evacuation of the public at the same time that firefighters are entering the area.

3. Reduce vegetation and fuel conditions in the wildland/urban interface (WUI) to reduce potential fire spread and intensity between National Forest System lands and adjacent private lands.

Need: The current fuel situation in the WUI, the terrain, prevailing winds and long term drought are conditions that pose a concern for a potential wildfire to spread either from the National Forest to private lands or from private lands onto the National Forest. It would be unacceptable to allow a fire spreading from the National Forest to threaten private property and conversely, a fire spreading from private land onto the National Forest. The WUI for this analysis area is along the northern boundary where private land meets National Forest Land in both Hyalite Creek and Bozeman Creek; and along the northwest boundary adjacent to the ridge between Hyalite Creek and Cottonwood Creek. The common goal would be to reduce fuels in the WUI, which will reduce conditions for initiation and spread of crown fire, which will lessen the fire behavior potential of a fire spreading from or to National Forest lands.

Proposed Action

The Proposed Action

The proposed action was presented to the public during scoping process (see Public Involvement section in this chapter). It was designed to achieve the purpose and need for action. Other alternatives to the Proposed Action are detailed in Chapter 2 and are designed as alternative ways to meet the purpose and need.

The actions proposed include:

* Partial harvesting and thinning is proposed for about 2,200 acres of mature timber stands. Ground based, skyline, and helicopter harvest systems would be used to implement this harvest and thinning.
* Mechanical cutting and piling of younger, small diameter trees would occur on about 1,150 acres. Hand piling would be used in some places.

* Prescribed burning would occur in the thinned stands after harvest or cutting.
* Approximately 850 acres of broadcast burning in less dense stands is proposed.

Project Area

The project area is at T 3S., R 5 and 6E and encompasses approximately the lower one third of the Bozeman Creek and Hyalite Creek drainages beginning just to the north of the Moser Creek Road and the Langohr Road in the Hyalite drainage. The northern part of Hyalite is drained by Hodgman Creek and Leverich Creek. The project area on the eastern side includes a portion of the Gallatin Fringe Inventoried Roadless Area. The area along the northern boundary of the project area where private land abuts National Forest land constitutes the wildland urban interface (WUI) with several homes and sub-divisions in this WUI area. Many of the homes are within one half mile from the forest boundary.

The City of Bozeman water treatment plant is located just outside the National Forest boundary on Bozeman Creek. Two water diversion dams that channel water to the treatment plant, one each on Bozeman and Hyalite Creek, are approximately one mile inside the Forest boundary adjacent to the paved Hyalite Road and the closed Bozeman Creek Road.

Detail of Treatments Being Proposed

To achieve a meaningful reduction in fire severity and extent, the proposed action would treat extensive areas of forested land within these two drainages to reduce forest density, increase crown base height and reduce existing high levels of down woody debris. The proposed treatments would be implemented over an eight to ten-year period and concentrated within the lower reaches of both drainages. In order to maintain a reduced level of fire severity and probability, future maintenance treatments would likely be necessary as the forest grows and changes.

Thinning and partial harvest in mature timber stands

Treatments proposed include harvesting in mature stands of timber, cutting smaller diameter trees and leaving larger ones to reduce the fuel loading and break up the vertical and horizontal composition of the fuels. Fuel treatment could be whole tree yarding, pile burning and jackpot or understory burning, or biomass removal. Due to the existing stand condition the implementation would be patchy in appearance since there are areas of up to an acre with dead or dying lodgepole pine. None of the trees in these patches are suitable to leave. Overall about 50% of the trees in a stand would be removed. There would be an approximate 300 foot buffer from Hyalite or Bozeman Creek with handpiling only for the fuel treatment. The actual buffer would be based on distance and topography.

Thinning in small diameter stands

Mechanical or hand cutting and piling smaller, younger trees would reduce the density of small diameter stands. These are areas with past harvest in the upper slopes and divide between Bozeman Creek and Hyalite Creek. There may be commercial products in some of the stands. Many fuel treatment options are available depending on products and market. Mechanical processing may be most efficient as far as economics and production. Cutting with chainsaws, hand pile and burning may be the most costly and labor intensive. Whole tree yarding, selling post and poles, selling chips for pulp or hog fuel are some options. Other machines are available that can chop, crush and shred otherwise un-merchantable material to reduce fuels. Follow-up burning is desirable. Limit the treatment to areas that can be reached from the existing roads.

Prescribed burning in thinned stands

Fuel treatment could include whole tree yarding to remove most of the fuels left after harvest. Where needed these activity and natural fuels would be understory burned if helicopter yarded or machine piled and burned if using ground based system. Machine piles could be done by several methods during the harvest or after, such as feller-buncher, grapple piling or excavator piling. Other fuel treatment options could be incorporated such as cut and trample with the feller-buncher, or cut-to-length forwarders that also trample slash. It would still be necessary to follow up with prescribed burning.

Broadcast burning

Broadcast burning in less dense stands of trees to reduce ground cover and smaller trees in order to keep the stands in an open condition with less chance of rapid fire spread. Spring or fall burning could be used.

Combined Effect of Treatments

The combined treatments change the landscape's fuel loading and distribution of fuels to reduce the potential for large scale and severe wildfires. The goal of treatments, either a combination of mechanical and prescribed fire or prescribed fire alone, is to convert or restore sites of high or moderate fire hazard to moderate or low; and keep low fire hazard areas from becoming moderate or high. These areas would become more fire resilient and display fire behavior such as lower intensity more characteristic of the site.

Decision Framework

Given the purpose and need, the deciding official reviews the proposed action, the other alternatives, and the environmental consequences in order to make the following decisions:

- The kinds of fuel treatments that would best help to reduce the severity and extent of potential wildfire in the lower reaches of the municipal watershed.
- The amount and location of the treatments to be most effective in reducing the severity and extent of potential wildfire.
- The short term risk and tradeoff to resources such as water quality and visuals that these activities would cause weighed against the long term risk of severe wildfire.
- A Forest Plan amendment for visual quality standards for the landscape condition could be part of the decision.

The Forest Service has signed a Memorandum of Understanding with the City of Bozeman to "establish a framework for cooperation between the parties to maintain (in the long term) a high-quality, predictable water supply for Bozeman through cooperative efforts in implementing sustainable land management practices".

Decisions made for National Forest System lands are separate from those made by the City. Land management decisions on Federal lands within the watershed are made solely by the Forest Service. Decisions on City lands within the watershed and decisions about City water treatment and storage facilities remain outside the scope of any Forest Service decision although the cumulative impacts of any treatments on City lands in Bozeman Creek are analyzed in Chapter 3 and would be considered in the decision.

Public Involvement

The Notice of Intent (NOI) for the Bozeman Municipal Watershed project was published in the Federal Register on October 18, 2005. The NOI asked for public comment on the proposal. In addition, as part of the public involvement process, the agency asked that initial comments on the project be submitted by November 11, 2005.

A public scoping document was sent to agencies and interested individuals on September 19, 2005. The scoping document described the project area, laid out the purpose and need for the project, and identified some preliminary issues associated with the project. The list of individuals, agencies, and interest groups who were sent the scoping document are part of the project record.

Because the two drainages involved, Bozeman Creek and Hyalite Creek, encompass the City of Bozeman Municipal Watershed, The Forest Service worked closely with the City of Bozeman administration on the purpose and need. The City and the Forest Service signed a Memorandum of Understanding concerning our mutual goals and objectives. This MOU is a part of the public record.

The Bozeman Watershed Council, a local interest group concerned about the management of the watershed, had been meeting periodically with the Forest Service.

They produced an assessment of Bozeman Creek in 2004 outlining the management needs for the drainage.

Other interest groups, concerned citizens, and the local rural fire districts had collaborative discussions with the Forest Service on the specific needs of the watershed prior to the initiation of the project.

The following is a summary of the public participation that has occurred since the announcement of the project:

1. During the public comment period we received detailed letters from 18 individuals and 11 interest groups. These are part of the project record. The comments that were received in these letters were developed into the issues that are described below.
2. On May 3, 2006 we had a meeting with several individuals and groups for a briefing on the issues that had been raised during scoping and afterward.
3. We had numerous meetings with the City of Bozeman staff members to coordinate our efforts.
4. On June 12, 2006 we briefed the Bozeman City Commission on the progress of the project.
5. On August 3, 2006 we sent a letter to all those on our mailing list briefing them on progress.
6. On August 8, 2006 there was a field trip to the project area for congressional staffers and others.
7. On September 13, 2006 an open house was held to bring the public up to date on the alternatives that were being developed for the DEIS.
8. During the month of May, 2007, the District Ranger sent invitations and issued a press release that he was having four "morning coffee" meetings for people to come, visit, and get an update on the project. These were held at the Eagle Mount conference room.

Using the comments from the public and other agencies the interdisciplinary team developed a list of issues to address.

Issues

The Forest Service separated the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or

which have been covered by prior environmental review (Sec. 1506.3)…". As for significant issues, the Forest Service identified the following issues:

1. Fire and Fuels – The issue is the effectiveness of reducing fuels in forested vegetation as a way to reduce fire severity in case of a wildfire.
2. Water Quality - The issue is the long term tradeoff of risking potentially severe wildfire and associated high sediment increase risk compared to the activities of this proposal and possible short term increases in sediment to the City of Bozeman water treatment plant.
3. Fisheries – what are the fisheries that could be affected by wildfire and how would they be affected by the activities necessary to reduce the potential for severe wildfire.
4. Scenery – how will the visual quality standards of the Forest Plan be met with this proposal and what tradeoffs might need to be made for long term fire protection.
5. Inventoried Roadless Land – the issue with inventoried roadless lands is whether the activities associated with the project will diminish their wilderness character in any way.
6. Lynx - Fuel reduction treatments in lynx habitat can reduce security cover, remove coarse woody debris, which is a key component of lynx denning habitat, and alter the preferred habitat of their primary prey species, snowshoe hare (*Lepus americanus*).
7. Northern Goshawk - Commercial thinning and prescribed burning can alter goshawk nesting, post fledging and foraging habitat. Some habitat modifications resulting from such actions could have

Other Issues

8. Forested Vegetation – what is the condition of the fire-adapted forest vegetation in these watersheds that makes it vulnerable to severe wildfire and what are the most appropriate actions to take that can help restore it to more natural conditions.
9. Recreation - Proposed fuel treatments in the Bozeman Creek and Hyalite drainages may affect recreation use during periods of operations.
10. Economics – What is the most economically efficient and effective ways to meet the purpose and need of the project.
11. Air Quality – how will the air quality be affected by the prescribed burning activities of the proposal and its alternatives.
12. Weeds - Proposed activities such as prescribed burning and removal or thinning of the forest canopy, activities that displace ground cover such as road construction, yarding of logs, and log landing construction and their use may cause new noxious weed populations to become established and existing populations to expand.

13. Soils – How will the Regional soils guidelines be met considering the proposed ground disturbing activities of the project.

14-21. Other Wildlife - what effects will this project have on wildlife species such as the black-backed woodpecker, grizzly bear, gray wolf, bald eagle, migratory birds, wolverine, marten, elk and other big game.

CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

This chapter describes and compares the alternatives considered for the Bozeman Municipal Watershed Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., helicopter logging versus the use of skid trails) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the amount of erosion caused by helicopter versus skidding).

Alternatives Considered in Detail

The Forest Service developed five alternatives, including the No Action and Proposed Action alternatives, in response to issues raised by the public and agency specialists.

Alternative 1

No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. No fuel reduction activities would be implemented.

Alternative 2

The Proposed Action

This alternative is a more detailed version of the proposed action presented to the public during scoping. An interdisciplinary team with specialties in hydrology, fisheries, wildlife, silviculture, ecology and wildland fuels convened with data layers for soils, vegetation, fuels and fire risk. The data layers were used in concert with watershed, fire behavior and landscape dynamic models to identify the infrastructure, land base and environmental conditions of most concern. The proposed action alternative reflects the priority treatment areas and one treatments scenario that would address the purpose and need for actions. A more detailed description of the treatment prescription and implementation methods is in Appendix A.

The actions proposed in this alternative include:

* Approximately 850 acres of burning in less dense stands is proposed.
* Mechanical cutting and piling of young trees would occur on 1,150 acres. Mechanical thinning or hand methods would be used to implement this thinning.

* Partial harvesting is proposed for about 2,200 acres. Ground based (23%), skyline (32%), and helicopter (45%) harvest systems would be used to implement this thinning.
* Features common to Action Alternatives, mitigation and activities associated with the primary treatments is in this Chapter beginning on page 12.
* This Alternative would require a project-specific Forest plan amendment to exempt the proposed fuel reduction treatment from meeting the Forest Plan visual quality objective (VQO) on the Gallatin Face (FP, pg. II-16) in units 12, 13, 22.

The location of proposed treatment units can be found on the Figure 2-1, Alternative 2 Map. Approximately 7.2 miles of temporary harvest road would need to be constructed and 3 miles of old road reopened. Approximately four hundred acres of the partial harvesting would occur in the Gallatin Fringe Inventoried Roadless Area. Harvest in the Inventoried Roadless Area would be accomplished by helicopter and no roads would be built. The approximate duration of the proposed activities would be a 5-12 year timeframe.

Alternative 3

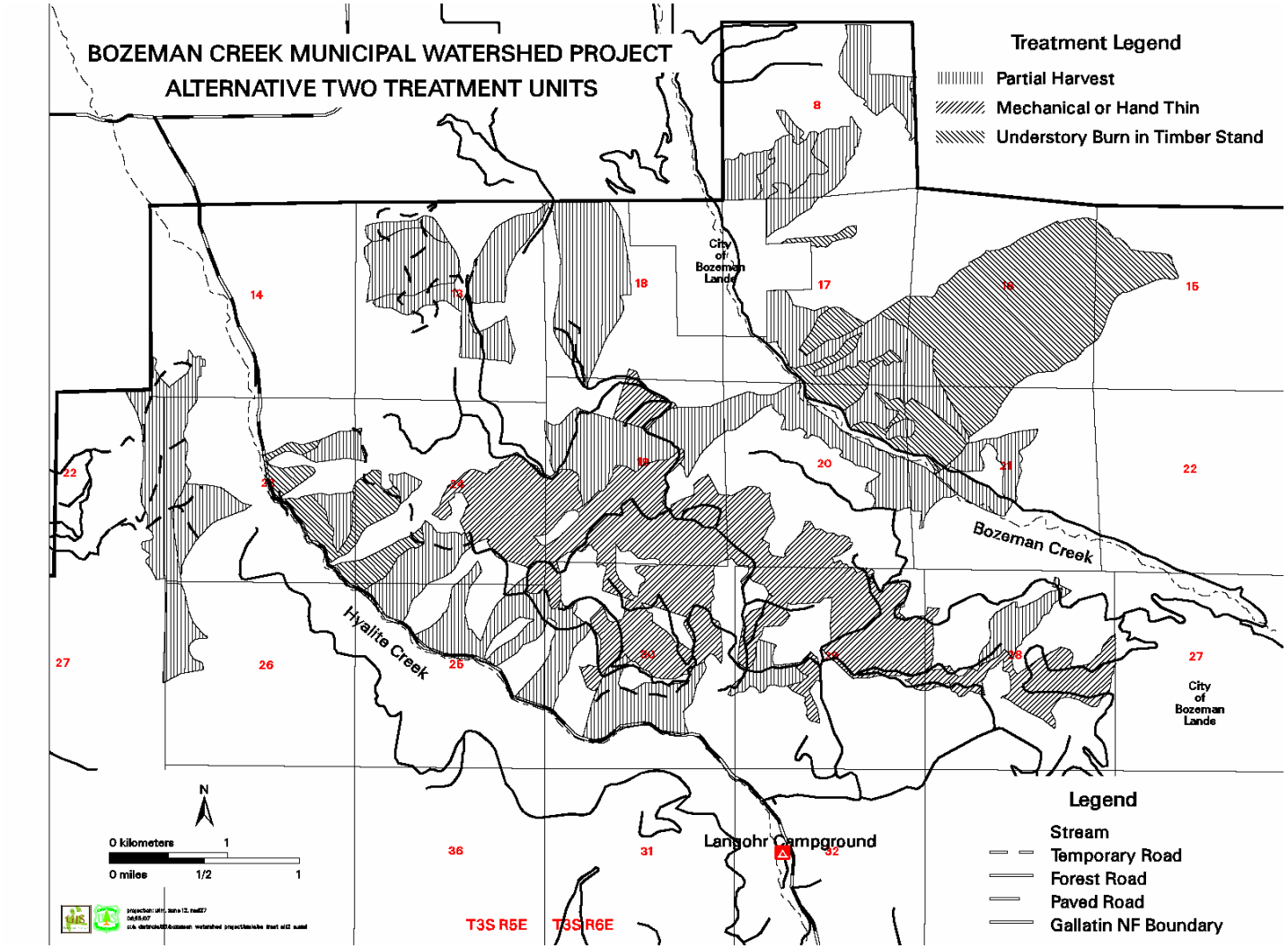
This alternative was designed to meet the purpose and need for action achieve the desired future condition more aggressively than Alternative 2. Given the extent of and current condition of the municipal watershed, an issue was raised by agency specialists that the proposed action was not extensive enough to be effective toward meeting the purpose and need for action. Treating additional acres would more effectively reduce the potential extent of future crown fires resulting in less severe fires and fire behavior.

The mitigation or design features unique to this alternative includes the addition of approximately 2,300 treatment acres and the associated roading. There is additional burning and thinning of large trees. The logging method for the units proposed for thinning large trees is approximately 19% ground based, 31% skyline harvest and 44% helicopter harvest. A more detailed description of the treatment prescription and implementation methods is in Appendix A.

The actions proposed in this alternative include:
* Approximately 1100 acres of burning in less dense stands is proposed.
* Mechanical cutting and piling of young trees would occur on 1,150 acres.
* Partial harvesting is proposed for about 3,900 acres. Ground based, skyline and helicopter harvest systems would be used to implement this thinning.
* Features common to All Action Alternatives, mitigation and activities associated with the primary treatments is in this Chapter beginning on page 12.
* This Alternative would require a project-specific Forest plan amendment to exempt the proposed fuel reduction treatment from meeting the Forest Plan visual quality objective (VQO) on the Gallatin Face (FP, pg. II-16) in proposed units 12, 13, 14, 15, 20, 22, 27, 28, 29, 30.

The logging method for the units proposed for thinning large trees is approximately 19% ground based, 31% skyline harvest , 46% helicopter harvest, and 4% helicopter/cable.

Figure 2.1: Alternative 2 Map.



Alternative 3 (Continued)

For better viewing of the Map go to
http://www.fs.fed.us/r1/gallatin/?page=projects/bozeman_watershed

Mitigation specific to this Alternative:

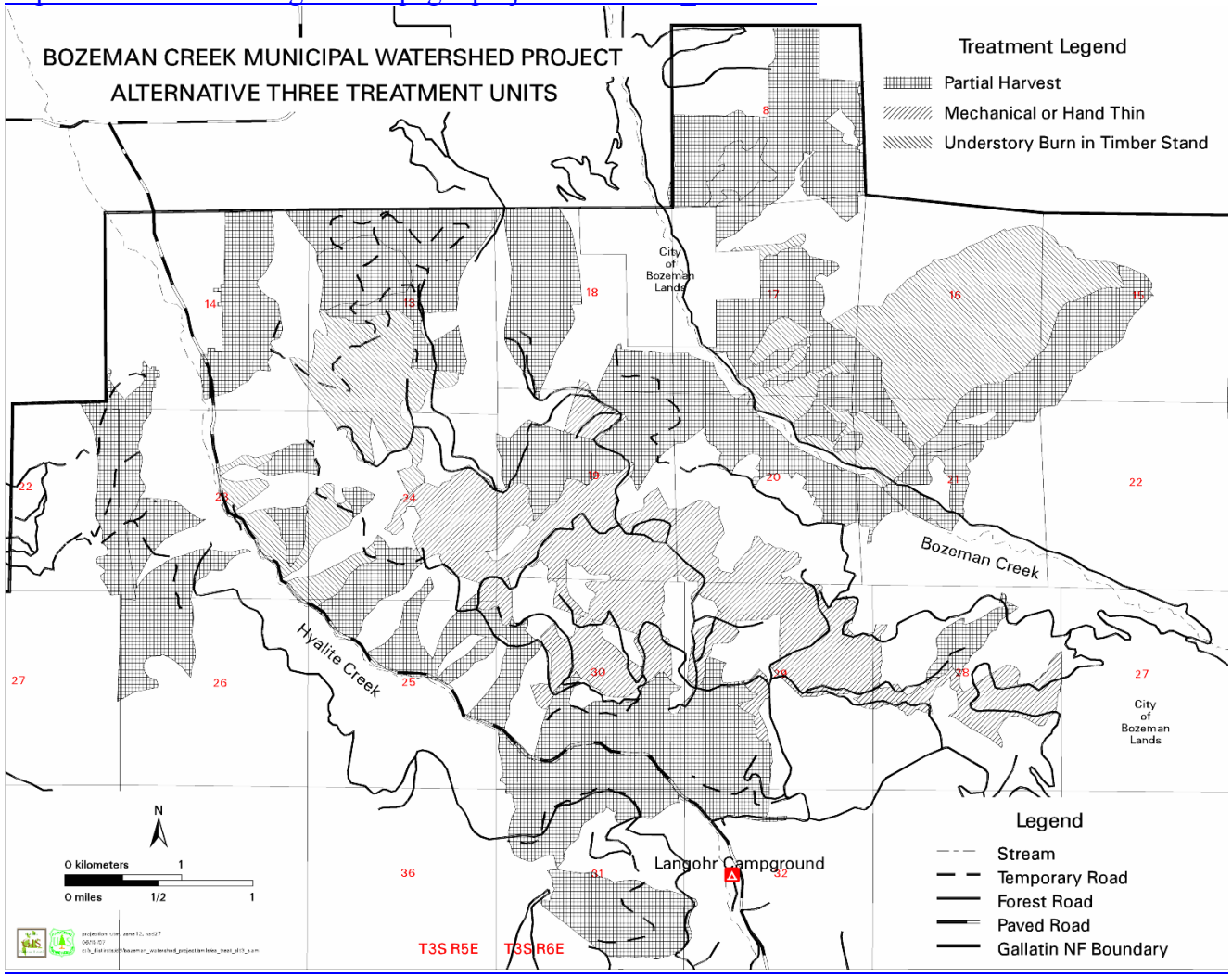
1. Unit 19: This unit is located in an area that was assigned a Forest Plan (FP) Visual Quality Objective (VQO) of Modification, and if all non-unit-specific mitigations that are listed were implemented, it would meet this VQO. However, due to it being in the viewshed from the Hyalite Road beyond Langohr Campground (especially the easternmost section that faces the Hyalite Road), in an area where other harvest units are very visible, it is recommended that more of this thinning be accomplished either with broadcast burning, ground based systems or helicopter, instead of cable systems. If this is uphill cable thinned, care should be taken to keep trees immediately downhill of the road bench and to keep it and uphill cut slope somewhat screened; lateral pulls should be used to minimize the visual dominance of the each main cable pull corridor; the lengths of the cable pulls should all be different so that the road below does not become more visible and so the unit boundary is not discernible. Also, the unit should transition into areas outside the unit, as explained in Mitigation #1 in the Features common to Action Alternatives.

2. Units 18 and 20: The lower sections of all of the proposed uphill cable portions should be field monitored while work is progressing, from all points along the Hyalite Road to avoid introducing visually dominant cable drag corridors, or allowing existing FS Road 3161 or the proposed road to become visually dominant with the use of equipment on sight. For example, this may include minor changes to implementation such as leaving clumps of trees or altering drag corridors. The Hyalite Road continuously curves and offers changing views of the surrounding hillsides, up to the ridges, at many different points. This mitigation is to prevent drivers from coming around a corner and being faced with a visually dominant cable unit and road on the upper slopes.

The location of treatment areas can be found on the Figure 2-2: Alternative 3 Map.

Approximately 13.5 miles of temporary road would need to be constructed and 5.4 miles of old road re-opened. Six hundred and seventy five acres of the partial harvesting would occur in the Gallatin Fringe Inventoried Roadless Area. Harvest in the Inventoried Roadless Area would be accomplished by helicopter and no roads would be built. The approximate duration of the proposed activities would be a 5-12 year timeframe.

Figure 2-2. Alternative 3 Map. For better viewing of the Map go to http://www.fs.fed.us/r1/gallatin/?page=projects/bozeman_watershed



Alternative 4

The No Logging/Prescribed Burning Alternative

The mitigation or design feature unique to this alternative is that the design of treatments would be limited to prescribed burning, small tree removal and no additional roads. This alternative combines an effort to meet the purpose and need for action without thinning large trees using logging methods. This alternative is also the agency response to the request during scoping to consider an alternative limited only to prescribed burning and to consider an alternative with no additional roads. A more detailed description of the treatment prescription and implementation methods is in Appendix A.

The actions proposed in this alternative include:

* Approximately 3,850 acres of burning in less dense stands is proposed.
* Mechanical cutting and piling of young trees would occur on 1,250 acres.
* Features common to All Action Alternatives that are applicable to burning and precommercial or small tree thinning treatments, mitigation and activities associated with the primary treatments are listed in this Chapter beginning on page 12.
* Treatments proposed under this Alternative are consistent with the Forest Plan Visual Quality Objective standard.

The Gallatin Fringe Inventoried Roadless Area (IRA) would have prescribed burning but there would be no harvest in the IRA. The approximate duration of the proposed activities would be a 5-12 year timeframe. The location of treatment areas can be found on the Figure 2-3: Alternative 4 Map.

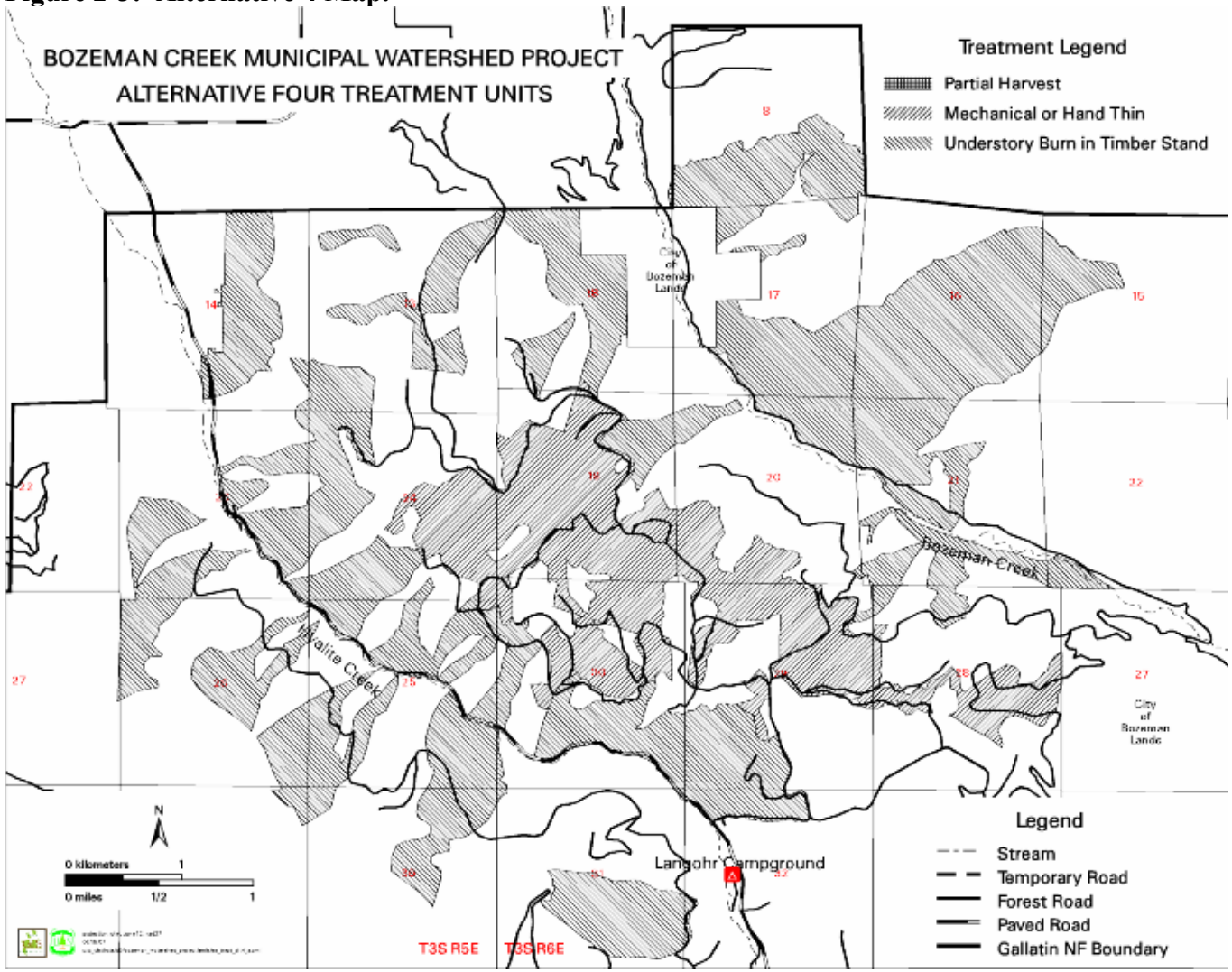
Upon further analysis, the fire management specialists determined that about 2,000 acres proposed for prescribed burning in this alternative would not be feasible to burn. The reason these acres would not be feasible includes some combination of eight factors described in more detail in the Fuels Report (Brickell 2007). An example of the factors include consideration of whether the risk and consequences of escape are acceptable when existing fuel load is high and pretreatment is limited to small tree removal. Another example is whether burning without pretreatment (harvest) to reduce potential fire intensity may cause greater mortality and stress to trees leading to greater fuel loading in the area. (Brickell, 2007) More discussion of this information is in the Fire/Fuels Report (Brickell 2007).

Design Mitigation specific to this Alternative:

Do not create a straight burn edge at the north boundary of Unit 11 where it abuts private land.

For better viewing of the map go to
http://www.fs.fed.us/r1/gallatin/?page=projects/bozeman_watershed

Figure 2-3: Alternative 4 Map.



Alternative 5

Preferred Alternative

Alternative 5 is designed to improve the effectiveness of the project toward meeting the purpose and need for action while mitigating unacceptable impacts to scenery, watershed, and westslope cut throat trout. Design of this alternative also incorporates treatment areas in and near the wildland urban interface that were unintentionally left out of other alternatives or after additional analysis areas were determined to be strategically important to treat with respect to fire spread. Additionally this alternative makes revisions in treatment prescription and/or method where more accurate information enabled specialists to make more accurate treatment recommendations.

The actions proposed in this alternative include:

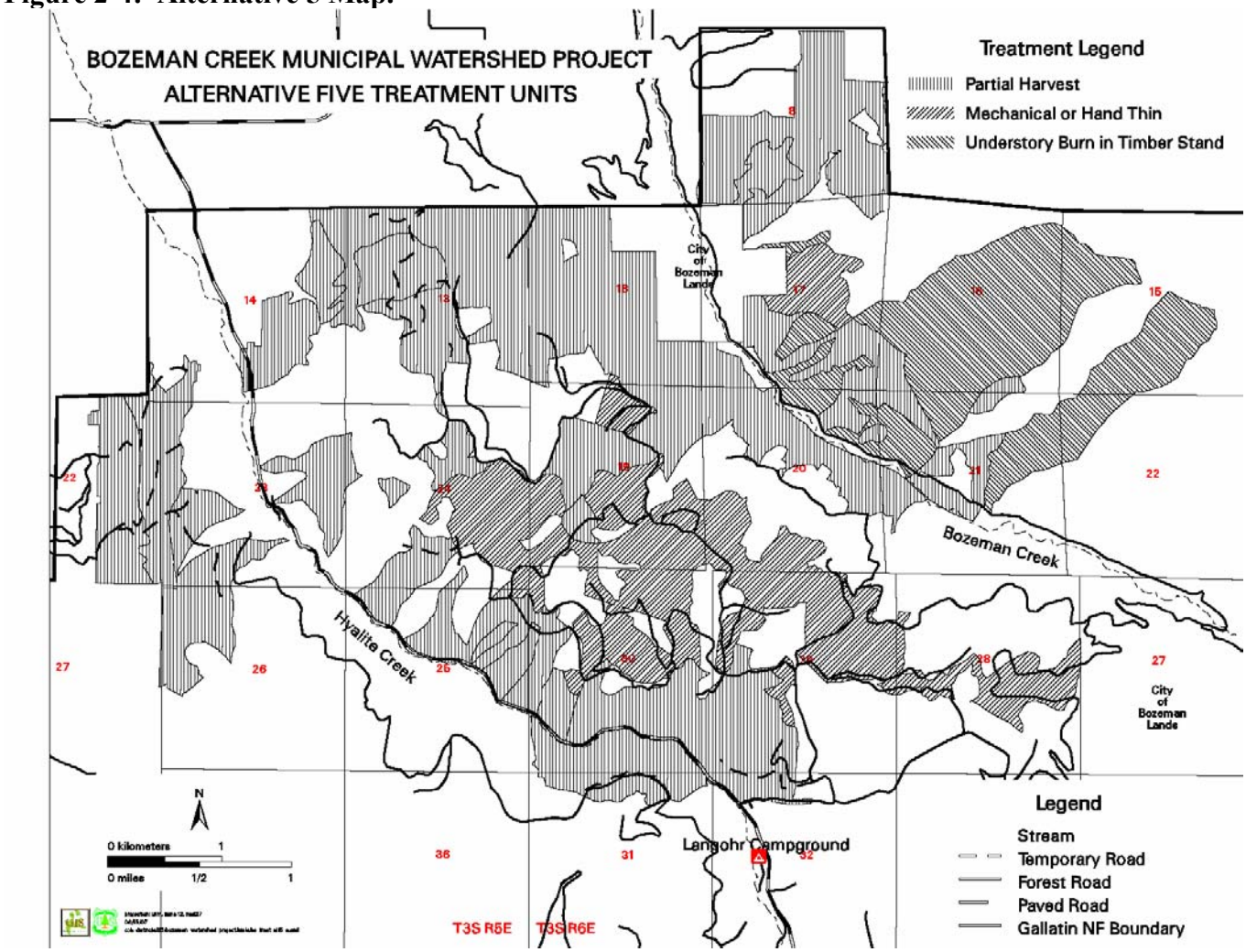
* Approximately 950 acres of burning in less dense stands is proposed.
* Mechanical cutting and piling of young trees would occur on 1,200 acres.
* Partial harvesting is proposed for about 3,700 acres. Ground based (21%), skyline (12%) and helicopter harvest (67%) systems would be used to implement this thinning.
* Features common to All Action Alternatives, mitigation and activities associated with primary treatments are listed in this Chapter beginning on page 12.
* In this Alternative, the proposed treatments are consistent with the Visual Quality Objectives standard. However, in order to improve the existing condition from past activity, a project-specific Forest plan amendment would be required to change the Forest Plan visual quality objective (VQO) on the Gallatin Face (FP, pg. II-16) from Partial Retention to Rehabilitation specifically for the following two areas: the east side of Unit 13 where helicopter thinning would provide visual mitigation to an existing clearcut cable unit by visually breaking up the straight sides and upper road edge; and to the northwest edge of Unit 25 where tractor thinning would reduce the sharp edges and visual contrast of the leave strip between two existing clearcuts. A more detailed description of the treatment prescription and implementation methods is in Appendix A.

The location of treatment areas as modified can be found on the Figure 2-4: Alternative 5 Map.

The logging method for the units proposed for thinning large trees is approximately 21% ground based, 12% skyline harvest and 67% helicopter harvest.

Approximately 6.9 miles of temporary road would need to be constructed and 1.7 miles of old road re-opened. Approximately six hundred acres of the partial harvesting would occur in the Gallatin Fringe Inventoried Roadless Area. Harvest in the Inventoried Roadless Area would be accomplished by helicopter and no roads would be built. The approximate duration of the proposed activities would be a 5-12 year timeframe.

Figure 2-4: Alternative 5 Map.



For better viewing of the Map go to http://www.fs.fed.us/r1/gallatin/?page=projects/bozeman_watershed

The following mitigation would apply to Alternative 5 and specifically address resource conflict.

- Temporary road construction associated with skyline logging would be eliminated or reduced in Units 12, 13, 14, 15, 16, 19, 20, 22, 27, 28, 29 30. Alternative 5 has a net reduction of about 6.7 miles of proposed temporary road construction compared to Alternative 3. Total proposed temporary road construction is 6.9 miles.

- A slash filter windrow would be installed below temporary road B-50, within the Leverich Creek drainage, as needed. This mitigation affects about .015 mile of road and is limited to the areas where soil movement could be directed to any water

- Within Leverich Creek drainage, a three year separation between logging operations in proposed Units 25 and 26 and the other units to allow for recovery of sediment levels.

- In order to maintain predicted sediment levels at or below desired levels, the total number of acres of ground disturbance was reduced in Hyalite and Leverich Creek drainages. In the Hyalite drainage, Unit 19 and a portion of Unit 20 were dropped from consideration. In the Leverich drainage the skyline portions of Units 25 and 26, and a portion of Unit 13 below road 3166 between existing plantations were dropped from consideration.

- In Leverich Creek drainage, portions of Units 11, 12, 25, 26, 36 and 37 were withdrawn due to presence of riparian areas. Also, Class 1 streams in Leverich Creek would have a 100 foot setback on both sides of the channel for a riparian buffer which is approximately double the standard riparian buffer. These measures protect an area greater than the standard best management practice typically required in riparian areas.

- The steeper portion of Units 12, 13, 14, 15, 20, 22, 27, 28, 29, and 30 would be helicopter yarded to avoid the visual effect of skyline drag corridors and associated temporary road cuts. Small portions of the areas mapped for skyline cable yarding in Unit 20 would face directly face traffic on the Hyalite Road, and of Unit 22 that would directly face downhill traffic on the Hyalite Road, just north of Langohr Campground, would be helicopter thinned, instead of skyline cable. This method change avoids cable draglines and roads at the top of the cabled areas. These features tend to become visually dominant when viewed straight-on.

- Ground based harvest in Units 25 and 26 in the Leverich Creek drainage would be limited to winter logging over snow or frozen ground per the Soil Best Management Practices.

Features Common to all Action Alternatives

The following description applies to all action alternatives. However, each alternative is unique in extent and/or emphasis on specific method.

The vegetative management activities identified for the alternatives are 1) burning in less dense stands of trees to reduce ground cover and smaller trees in order to keep the stands in an open condition with less chance of rapid fire spread; 2) mechanically or hand cutting and piling smaller, younger trees to reduce the density of these kinds of stands; and 3) partially harvesting mature stands of trees, cutting smaller diameter trees, and leaving larger ones to reduce fuel loadings and break up the composition of vertical and horizontal fuels. Appendix A has a more detailed description of these treatments.

Types of activities associated with the primary treatments may include treatment of activity and natural fuels such as slashing, lop and scatter, handpiling, machine piling, whole tree yarding, yarding unmerchantable material, pile burning, jack pot pile burning, underburning, broadcast burning, erosion control actions, soil restoration activities, road construction, maintenance and closure, revegetation and weed control. This list is not an exhaustive list but is intended to share the range of activities associated with thinning and burning.

The following design features would be applied during implementation of the action alternatives.

Air Quality (Story 2007)

1. Within the minimum ambient distances the public will be warned about high smoke concentrations and advised not to travel outside of a vehicle or residence during the time of burning. Pile burn units would only be burned one unit at a time to avoid cumulative smoke effects between units. Smoke from the unit should be minimal when the next unit is burned.

2. The broadcast burns, underburns, and pile burns would be coordinated with the Montana/Idaho State Airshed Group (http://www.smoke.org).

Amphibian Species (Roberts 2007)

1. Adhere to the Wetland Executive Order 11990.

2. Retain a no-burn buffer of at least 50 feet adjacent to Bozeman Creek, Hyalite Creek or other perennial named and unnamed streams.

3. Ignite prescribed burns in a manner that would prevent head fires within riparian areas adjacent to ephemeral or intermittent draws. Ignition would not occur within these riparian areas, but fire would be allowed to back down hill and creep around.

Aquatic (Roberts 2007)

The following list of activities is specific to the Leverich Creek drainage. These features are in addition to those built into the Alternative 5 proposal, required by Stream Management Zone (SMZ) laws or Best Management Practices or direction in the Gallatin National Forest Travel Management Decision (FEIS, Detailed Description of Decision, 10, 2006, pp.I-12-14. The mitigation are broken into two categories 1) design features and 2) off-set measures to off-set project generated sediment.

<u>Off-set measures to be implemented prior to fuel reduction treatments:</u>

1. Surface the road prism of the county road along the lower Leverich Creek from the lowest culvert to the trailhead and improve drainage ditches and structures.
2. Stabilize the two stream crossings along FS Trail # 435.
3. Close and stabilize the user built trail up the ridge between the left and right forks.

<u>Design Mitigation to be implemented during fuel reduction activity.</u>

1. Maintain the existing foot print of the Leverich Creek trailhead parking area. Avoid placing logs and slash outside the existing foot print;
2. Construct a sediment fence around the Leverich Creek trailhead parking area if used as log landing; and,
3. Avoid all mechanical repairs and refueling at the Leverich Creek trailhead parking area.

Heritage Resources (Allen 2006)

1. An archaeologist and the sale administrator would flag off the one known archeological site when work is in the vicinity to protect it from disturbance.
2. If any additional heritage assets should be encountered during the project, then disturbing actions would be halted immediately and an archaeologist contacted.

Noxious Weeds (Councilman 2007)

Based on suggestions and guidance in Clark (2003), USDA Forest Service, Guide to Noxious Weed Prevention Practices (2001), and Forest Service Manual 2080 a number of preventative actions would be implemented for this project.

1. Avoid or remove sources of weed seed and propagules from vehicles to prevent new infestations and the spread of existing populations of weeds (provide weed washing stations and inclusion of the timber sale contract provision that require washing).
2. Conduct activity area surveys and treatment of weeds before activities commence.
3. Identify and avoid areas infested where activities could spread weed seeds. Maintain weed-free equipment parking; helicopter refueling areas, equipment staging areas, log landings, and area roads. Monitor for and eradicate new weeds promptly.
4. Retain native vegetation in and around logging areas and minimize soil disturbance by adhering to soil best management practices.
5. Reuse landings, skid trails, and helicopter landings when they are weed-free
6. Minimize the period from end of logging to contract closure, revegetation, and/or reforestation for long-term restoration (USDA Forest Service 2001). .
7. Provide weed awareness and education annually during of project implementation. Training will be given to Forest Service employees along with contractors (USDA Forest Service 2001).
8. Post project weed suppression on all activity areas.
9. Use only certified weed-free seed for rehabilitation of disturbed sites. Refer to local seeding guidelines for detailed procedures and appropriate mixes. Use native seed only. Revegetation may include planting, seeding, fertilization, and weed-free mulching as indicated by local prescriptions.

Range (Clark 2007)

1. Fences on the Bozeman- Hyalite divide or pasture fences between pastures in the Hyalite Canyon allotment would need to be protected during the fuels reduction treatments or they would need to be rebuilt by the project. If fuels treatments open up natural boundaries on the Bozeman-Hyalite Divide, fences would need to be built to replace the natural boundaries. In the Project Record, a map is provided to show existing fences and natural boundaries.

Recreation (Cary 2007)

1. Schedule and manage operations in the lower Bozeman Creek drainage so that year round (24/7) public restrictions will not be required.
2. Allow continued use of upper Bozeman Creek drainage, specifically Mystic Lake, by alternative access routes from Bear Canyon and Hyalite Canyon during operational periods in the lower (north) part of the drainage.
3. Restrict helicopter logging operations and hauling to Monday through Friday allowing for public access on Bozeman Creek Trail/Road, Moser Creek Road, Moser Jumpoff Road, and Langohr Road on weekends. This would exclude closures for prescribed burning operations during opportunistic weather time periods. At any given time, allow no more than one of the above main roads to be closed during fuels management operations.
4. Post information at appropriate access points to inform the public of project activities. Provide local media with updates about project work that may affect the recreating public. Post warning signs notifying forest users of potential hazards from fuel treatment activities when occurring adjacent to dispersed areas, roads, and trails. If necessary, issue special orders (regulations) that temporarily close some areas or routes to protect the public.
5. Contracts resulting from the decision would contain provisions for public safety by the development of a traffic control plan, including signing that would be agreed upon prior to treatment activities.
6. If temporary roads are constructed for the project in the Leverich Canyon drainage or adjacent side drainages their locations should be analyzed for feasibility as extensions or alternate routes compatible with the existing trail system.

Roadless (Cary 2007)

1. Carefully select cut trees in the larger size classes (greater than 8" dbh) to minimize the immediate visual impact to apparent naturalness. Select trees to cut growing in shrubby areas to hide cut stumps. Minimize the total number of large trees by concentrating cutting to high-risk trees (touching crowns, plentiful ladder fuels, etc.)

2. Remove only the minimum number of trees necessary to bring potential wildfire from the crowns to the ground.

3. Minimize stump heights to 8" or less. Angle cut faces way from any likely travel corridors. Place dirt or debris on cut stumps where possible.

4. Scatter slash to avoid "burnt skeleton piles of sticks" leftover after burning.

Scenery (Ruchman 2007)

1. Mark and thin the edges of all units in such a way so that unit boundaries are not easily discernible after the thinning work is accomplished. This means that no unit boundary edges visible from key observation points should be straight lines, even adjacent to city or private land, where ownership boundaries may be straight. In addition:
    a. Where units border unthinned, dense forest land, the unit edges should be irregularly shaped and feathered to be predominantly natural appearing. Feathering means that a transition zone of uneven depth is created inside the unit along the boundary in which the percent of tree removal should be gradually decreased toward the unit boundary.
    b. Where units border meadow or very open forest, the percent of tree removal in the transition zone should be increased to visually tie into those naturally open areas.

2. Within all units, where possible, leave trees with full crowns, as individuals or in groups, to achieve the appearance of naturally open grown crowns.

3. Unit 13: To avoid exacerbating a viewshed that is already not meeting the FP standard, most of the areas shown as cable in the east half of Unit 13 and the northwest-facing cable portions, in Alternative 2 and 3 should be helicopter yarded . This would also eliminate the need to extend the road further to the northeast and would avoid the existing road from becoming more visually dominant. To avoid a distinct visible edge along the northeast trending ridge, the helicopter fuel removal should continue around to the north side of that ridge, into the area shown as Unit 14 in Alternative 3. This would all be within ½ mile of the helicopter landing at the Leverich Trailhead. This helicopter thinning should also be used to mitigate the existing units' straight edges, by removing more heavily in places along those edges. Care should be taken to leave trees downhill of FS Road 3166 so that it does not become visually dominant.

4. Unit 16, 22: The lower sections of all of the proposed uphill cable portions should be field monitored while work is progressing, from all points along the Hyalite Road to avoid introducing visually dominant cable drag corridors, or allowing existing FS Road 3161 or the proposed road to become visually dominant with the use of equipment on sight. For example, this may include minor changes to implementation such as leaving clumps of trees or altering drag corridors. The Hyalite Road continuously curves and offers changing views of the surrounding hillsides, up to the ridges, at many different points. This mitigation is to prevent drivers from coming around a corner and being faced with a visually dominant cable unit and road on the upper slopes. The landscape architect would conduct this monitoring.

5. Unit 18: While the cable portion of this unit mostly faces east, the southern half faces somewhat northeast with a short section facing north and will be directly visible from the valley. In this area, care should be taken to leave good clumps of trees in front of the road, so it does not become visually dominant. Clumps of trees, of varying sizes, should be removed just above where most of the cable pulls meet the temporary road, so that, especially in winter, the road does not become highlighted by a solid line of trees above it.

6. Since the north edge of Unit 26 is very visible from the Gallatin Valley, create zone of transition into the adjacent dense forest to its north and to the west of Unit 33.

7. Where patches of more than ½ acre would be opened on steep slopes that face either Bozeman Creek Trail or Hyalite Road, within 200 feet above viewers on either the Road or Trail, all stump tops should be angled away from viewers.

8. Also on those steep slopes that immediately face viewers on Bozeman Creek Trail and that are low down along stretches of the Hyalite Road, fellers should be directed to attempt to reduce the amount of incidental leave-tree breakage, even if the fuel removal method is helicopter.

9. Where practical, all slash piles, decks and landings should be located out of sight of key observation points, and heavily used recreation corridors and areas. Where they cannot be located out of sight, they should be rehabilitated in such a way that after work is completed, they would not visually dominate the seen area.

10. All staging areas that are created by grading and flattening, or that receive enough use to compact soil or mix top and subsoil, and large burn piles that are within sight of the Hyalite Road, Langohr Campground, the Bozeman Creek Trail, Forest Trails #428 or #435, should have all topsoil scraped to the side and stockpiled before grading is done or any fuels are piled. Once the fuel removal work is finished, the areas should be recontoured to natural contours, covered with the topsoil, seeded and naturalized, so that within one year of this rehabilitation work, the site is fairly natural-appearing.

11. Those portions of temporary project roads that would be visible from and immediately adjacent to Forest Service Trail 428, and other trails and roads, should be located, where possible, in such as way as to reduce the visual dominance of the prism that will remain even after the project is completed. After thinning work is completed, those segments of temporary roads that are immediately visible and adjacent to FS roads and trails, especially FS Trail 428, should be recontoured and naturalized.

12. An emphasis would be placed on completing all slash burning and post thinning cleanup as soon as practical in those areas in the immediate foreground in key visual and heavily used recreation areas and corridors.

13. Fire control lines installed prior to burning should tie in, where possible, to existing opening and topographic features to create more natural looking burn patterns.

Monitoring Requirements

The Forest landscape architect would work with the presale forester to complete this monitoring.

1. During marking of the units, monitoring should be done to ensure that trees with sufficient crowns are being left and that the mix between full crowned individuals and tree clumps marked to retain are achieving the appropriate transition from dense forest into thinned and open areas.

2. As mechanical thinning is occurring, monitoring should be done from key observation viewpoints to ensure that the edges of units are broken up and as indiscernible as possible, so that if more transition into unthinned adjacent forest is needed, it can be

accomplished while the work is being done and equipment is available. This should also be done the winter following completion of each unit, while snow is on the ground to verify transition zones, and adjust transitions where needed.

3. Monitoring should occur from all along the Hyalite Road while work is occurring for Units 16,18,20 and 22 to ensure that the cable drag corridors and the associated proposed roads do not become visually dominant.

4. Monitoring should be done after each broadcast burn to determine if more than the proposed 20-30% of crowning is occurring. If so, and if the crown mortality resulting from the prescribed broadcast burning would have the potential of dominating an entire specific viewshed from a key observation point or corridor, adjustments should be made in how the burning is approached for units remaining in that viewshed.

Soil (Shovic 2007)

1. Gallatin National Forest Soils Best Management Practice (BMP) would be incorporated in project design (Shovic, 2007; Story, 2006b) in order to limit soil disturbance associated with implementation. Appendix B provides a listing of Best Management Practices.

2. In units with previous harvest or temporary road construction that would exceed the 15% regional soil standard (Shovic 2007) restoration action would be applied. The restoration activity would be sufficient to reduce the effects of previous harvest. Tables in the Soils section in Chapter 3 estimate the amount of restoration per alternative. Suggested restoration is recontouring and seeding existing skid trails and non-system roads in each previously harvested unit. Recontouring would help to restore the soil profile, increase infiltration, and reduce erosion. Recontouring is for slopes less than 20%, to maximize topsoil replacement. Slopes higher than this may result in bringing up infertile subsoil, increasing weed potential.

Monitoring Requirements

To verify the predictions used in this analysis, and to provide information for future work, soil productivity monitoring should be undertaken on all harvest units using ground-based systems. This should follow the current version of the Northern Region Soil Quality Monitoring Protocol (USDA Forest Service, 2007, or the current version at the time of sampling and authorized by Tidwell, 2007). It should be completed within two years of Activity Area completion. To verify the above predictions and

estimated effects in burn units, and to provide information for future work, monitoring should be undertaken on a representative sample of burn units.

Water Quality (Story 2007)

1. Retain a no-burn buffer of at least 50' for burn treatment areas adjacent to Bozeman Creek, Hyalite Creek, and perennial tributaries.
2. Apply standard BT timber sale protection clauses to the commercial harvest activities to protect against soil erosion and sedimentation. Include standard BMP's for all activities including Montana SMZ compliance rules.
3. Apply BMP's for Forestry in Montana (DNRC, 2004). These are incorporated into Appendix B – Best Management Practices. The Gallatin Forest Plan, Forest Wide Standards 10.2 (page II-23) requires that Best Management Practices (BMP's) will be used in all Forest watersheds during implementation of all timber harvest and road construction activities.

Monitoring
Water Quality/BMP's - At least 1 BMP review will be conducted for some of the thinning and broadcast burn units as well as for some the temporary road segments. The BMP review team will use the Montana BMP audit forms augmented by the additional BMP's and EIS required mitigation for the Bozeman Municipal Watershed Project. The objective of the BMP review is to document BMP and SMZ rule compliance and to validate the erosion and water quality effects predicted by examination soil erosion, runoff and water quality response, and re-vegetation of broadcast burns. A BMP review report, including observations and recommendations, will be prepared by the Gallatin NF Hydrologist and submitted to the Bozeman District Ranger.

Wildlife (Dixon 2007)

1. During the denning season (December through May), helicopter flight paths to and from the project area should avoid, or stay at least 1,640 feet above the ground, over high elevation (>7,500 feet) basins, cirques, and forested habitat that provide suitable wolverine reproductive habitat. This measure is needed only if the helicopter leaves Shenango Helibase enroute to the project area.

2. Avoid major activities (e.g. road construction, timber felling, slashing, skidding, hauling and burning) within 1 mile of primary marten denning habitat near Unit 15 from March to mid-June. (Map is in the project file)

3. Helicopter flight paths to and from the project area should either avoid, or be at least 500 m (1640 ft) above ground, around known grizzly bear use areas (south of the Sentinel in the Gallatin Range and south of Lone Mountain in the Madison Range). This measure is needed if the helicopter flies from Shenango Helibase or points south to the project area.

4. Pre-implementation surveys and post-implementation monitoring will be needed to identify and document the amount of snowshoe hare habitat reduced by fuel treatment procedures to comply with NRLA standards VEG-S5 and VEG-S6 ensure that no more than 6% (cumulatively) of lynx habitat on the Gallatin National Forest. "Fuel treatment projects within the WUI that do not meet Standards VEG S5 and VEG S6 may occur on no more than 6% (cumulatively) of lynx habitat on the administrative unit" (i.e. on the Gallatin National Forest).

5. Leave some piles of slash in openings created by thinning or burning to provide security cover for snowshoe hares to help maintain connectivity between remaining patches of foraging habitat that would otherwise be isolated following fuel treatment

6. Commercial harvest prescriptions should be designed to leave irregular patterns with clumps of trees and a variety of age and size classes more closely mimic natural forest landscape conditions in the area, that would provide suitable nesting habitat for most native species of migratory birds using the project area.

7. No fuel reduction activities would be implemented in big game secure habitat, in portions of Unit 3 and 7 during big game hunting season, which is generally the end of October to Thanksgiving weekend.

8. Nest Stand (47 acre) in Northern Goshawk Home Range (NGHR1) for northern goshawk would be dropped from consideration for management. (Map is in the Project File). A "no-fly zone" would be established (2,500 feet in all directions including above the nest) for the period of 15 April through 15 August. Use restrictions around the known nest site in NGHR1 would influence helicopter flight paths to and from the project area, and might also influence flight patterns for one harvest unit. (Maps in the Project File) There would be no harvest related activity within goshawk post-fledging area (PFA) (approximately 2411 feet) for northern goshawk from 15 April through 15 August. These timing restrictions would also apply to construction and use of short segments of temporary road needed to access harvest units.

9. Prior to commencing with major activities in close proximity (within 2,411 feet) of the possible nest sites associated with NGHR2 and NGHR4, additional surveys would be conducted in order to determine whether these sites actually contain occupied goshawk nests. If an active nest is found, portions of treatment units affecting the nest site (at least 40 acres around the nest tree) would be dropped, with timing and helicopter flight restrictions applied within the PFA.

10. Adhere to Forest Plan snag and woody debris retention standards in commercial thinning units. Trees and snags with obvious large nest structures or cavities should be left intact, with immediately surrounding vegetation retained to provide security cover

11. Timber harvest units proposed in MA –11 that provide big game winter range would adhere to the guidelines for scheduling timber sales. (GNF-FP p. III-33 to 36)

12. Roads constructed for project activity should be designed with minimum handbook standards necessary to accomplish the task, temporary in nature, and effectively gated to restrict public motorized use. Once the activity is complete, these roads should be permanently and effectively closed and re-vegetated. (GNF Travel Management Plan FEIS, Detailed Description of the Decision, Chapter 1-pp.11-14.)

13. A concerted effort would be made prior to project implementation to either locate an active nest, or to develop a high level of confidence that no active bald eagle nest site occurs in close proximity of proposed treatment units. Nest searches would generally be conducted between April 15 and May 5 for optimum detection rates. Nest searches would be conducted each year of project activity to ensure protection of occupied nest sites as well as to detect establishment of new or alternate nest areas.

14. There are no known nests in the vicinity of the project. (Bald Eagle Report, Dixon 2007), in the event one is discovered, there would be no major activity involving heavy equipment, aircraft, blasting, logging or burning within 1/2 mile of an active bald eagle nest from February 1 through August 15. This restriction precludes major activities/disturbance within Nest Site Management Zones I and II during the nesting season. Minor activities such as inventory, monitoring, marking, cruising and other preparation actions can occur, but should be conducted later in the season (after June 15) unless directly associated with nest site location and monitoring.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives may have been outside the scope of Bozeman Municipal Watershed Project, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Therefore, four alternatives were considered, but dismissed from detailed study for reasons summarized below.

Scoping Alternative

This alternative was the original proposal presented by the Forest Service for the initial scoping effort. (GNF, 9/2005) It was developed to achieve the purpose and need outlined in Chapter 1 of the EIS. Fuel reduction activities being considered included treating up to 6,000 total acres, including a small portion of the Gallatin Divide Inventoried Roadless Area in the Bozeman Creek watershed, and treating up to 3,000 acres in the Hyalite Creek watershed with a combination of prescribed burning, thinning, brush cutting, and commercial tree harvest. This proposal was a broad description for the area proposed for treatment and the types of treatments. It was the starting point from which Alternative 2-5 were developed. Alternative 2 is the detailed description of this conceptual alternative and was considered in detail.

Water Treatment Facility Improvements Alternative

During scoping, comments were submitted that asked the Forest Service to consider an alternative that improved water treatment facilities such as building sediment traps, upgrades to treatment plant, and wells. The intent was to focus mitigation on the City facilities to address the purpose and need rather than National Forest System (NFS) lands. The recommendations were shared with the City of Bozeman for consideration. These options are not within the decision authority for the Forest Service so this alternative is not within the scope of the decision. The City of Bozeman is considering upgrades to water management system and the suggestions provided by the public were forwarded to the City staff.

The City commissioned a facility plan evaluation of the treatment plant with the long term potential to convert from direct filtration to conventional or membrane filtration. The City of Bozeman Water Facility Master Plan (City of Bozeman, 2006)

http://www.bozeman.net/bozeman/engineering/documents/Water_Facility_Plan.pdf contains an extensive analysis of potential water treatment upgrade alternatives. The Bozeman City Commission endorsed the Facility Master Plan preferred alternative, which is the construction of a 22 million gallons per day filtration plant ultimately expandable to 36 million gallons per day. A raw water storage pond, which could be used to store up to a week of water in case wildfire compromised raw water quality, was not endorsed by the City of Bozeman due to excessive cost and doubts as to the effectiveness of such a raw water storage pond in the event of a major forest fire. The Water Treatment plant will initiate pilot testing of the membrane filter technology during 2007 with the goal of construction of the membrane filtration plant in 5-6 years.

In discussions with the City of Bozeman Water Treatment Plant personnel, the upgrading of the Water treatment plant will allow better filtering of pathogens and sediment but could still have operational problems during periods of high turbidity such as an intense rain event after wildfire. The treatment plant upgrade will not alleviate the need for reduction of wildfire potential in the source area watersheds - Bozeman Creek and Hyalite Creek. The City acknowledges it will have to consider several operational changes in the event of a fire within the watershed, based on the location and severity of the fire. The City is also considering the diversification of water sources as well as other water system improvements that will fit with their need to expand and protect their water source.

The purpose of the Bozeman Municipal Watershed Project is to begin reducing the potential severity and extent of future wildland fires in the watershed and begin creating vegetative and fuel conditions that would reduce the risk of excess sediment and ash reaching the municipal water treatment plant in the event of a wildfire. The role the Forest Service has is to manage NFS lands in a way that minimizes the risk of excessive sediment, ash or other contaminants reaching the facility from NFS lands.

While the City of Bozeman and the Forest Service are working together, each entity has a unique role. The Gallatin NF does not have jurisdiction on City of Bozeman water system operations.

Wildland Fire Use Alternative

During scoping the Forest Service was asked to consider an alternative that needed little investment such as fire use.

Currently the project area is within Fire Management Unit #3 Gallatin Protection in the Gallatin National Forest Fire Management Plan. This FMU is designated Interface/Intermix meaning WUI, Municipal Watershed, campground, dispersed recreation and heavy public use. Wildland Fire use is not an Appropriate Management Response (AMR) option based on the 1987 GNF FP FEIS and the values at risk. .

According to the Gallatin National Forest Plan (1987) the Management areas (MA) in the project area identifies fire suppression as the Appropriate Management Response. The Forest can utilize 'contain' and ‘confine' strategies relative to wildland fire before and after fire season (May 1 to Sept 30). Otherwise, during fire season the AMR is control.
Human caused ignitions would require a control strategy, unless safety to firefighters or values at risk allow for safer strategies/tactics, and cost considerations. Planned ignition (RX fire) is an option open to the area and is under consideration where appropriate.

Wildland Urban Interface Alternative

During scoping the Forest Service was asked to consider fuel reduction treatment only in the Wildland Urban Interface immediately around homes. Treatment in the WUI could easily be considered in a stand alone decision tiered to the current analysis. However, the purpose and need for action is primarily around protection of the Bozeman Municipal Water Treatment Plant and reducing the risk to the Municipal Watershed. Elimination of treatment outside of the WUI would not meet the purpose and need defined for this effort.

Comparison of Alternatives

This section provides a comparison Alternatives in four tables. Table 2.1 Actions Proposed for each Alternative, Table 2.2 Comparison of Measures of Fire Behavior, Fire Size and Probability related to the Purpose and Need for Action, Table 2.3 How well the Alternatives would meet the Purpose and Need for Action, Table 2.4 Comparison of Issues by Alternative that would be Factors in the Decision. Information in Table 2-4. Comparison of Issues is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives. These are the issues that would be factors in the decision.

Table 2-1. Actions Proposed for each Alternative

Alternative	Acres			Miles
	Mechanical thin of small trees less than 7" in diameter, pile and burn	**Prescribed burn**	**Partial harvest by mechanied thin trees over 6" in diameter.**	**Temporary Road Construction**
Alternative 1 (No Actions)	0	0	0	0
Alternative 2 (Proposed Action)	1150	850	2200	7.2
Alternative 3	1150	1100	3900	13.5
Alternative 4 (Prescribed burn/No logging or roads Alternative)	1250	3850	0	0
Alternative 5 (Preferred Alternative)	1200	950	3700	6.9

During implementation, it is expected that the actual acres treated would be in a range of no more than 10% higher and up to 25% lower that estimated. Acres proposed for partial harvest that are determined to be unsuitable due to difficult terrain or lack of commercial value would be considered for thinning and piling of the trees less than 7 inches in diameter. The variation in acreage is due to the large unit size. Within the proposed units there is variation in terrain and vegetation type, density, and size.

Table 2.2: Measures of Fire Behavior, Fire Size and Fire Probability Related to the Purpose and Need for Action. See Fuels Section in Chapter 3 for more detail.						
Measure & Desired Condition	**Outcome**	**Alternative 1 No Action**	**Alternative 2 Proposed Action**	**Alternative 3**	**Alternative 4 Prescribed Burn/No Logging or Roads**	**Alternative 5 Preferred Alternative**
Fuel Model Conversion From Fuel Model 10 to 8 or 184.	Crown fire potential is reduced. Fire behavior in FM184 /8 is expected to have lower flame lengths and spotting distance is reduced.	0 acres	3239 acres	5176 acres	1571 acres	4743 acres

Table 2.2: Measures of Fire Behavior, Fire Size and Fire Probability Related to the Purpose and Need for Action. See Fuels Section in Chapter 3 for more detail.						
Measure & Desired Condition	**Outcome**	**Alternative 1 No Action**	**Alternative 2 Proposed Action**	**Alternative 3**	**Alternative 4 Prescribed Burn/No Logging or Roads**	**Alternative 5 Preferred Alternative**
Crown Fire Potential Acres with fuel treatments that alter the expected fire type from crown fire to surface fire. The acres in this row indicate a reduction in crown fire potential so a higher number is desirable.	Surface fire indicates less severe and less intense fire. The potential extent of fire is reduced if surface fire conditions are maintained. These fires can be more effectively suppressed and they pose less risk to safety.	0 acres	3239 acres	5176 acres	1571 acres	4743 acres

Table 2.2: Measures of Fire Behavior, Fire Size and Fire Probability Related to the Purpose and Need for Action. See Fuels Section in Chapter 3 for more detail.						
Measure & Desired Condition	**Outcome**	**Alternative 1 No Action**	**Alternative 2 Proposed Action**	**Alternative 3**	**Alternative 4 Prescribed Burn/No Logging or Roads**	**Alternative 5 Preferred Alternative**
Potential Fire Size [1] 85th weather percentile 97th weather percentile The lowest potential fire size is most desirable.	These measures indicate potential fire severity and extent of fire.	2778 acres 7760 acres	1242 acres 3610 acres	950 acres 3943 acres	1929 acres 5939 acres	957 acres 3693 acres
% Reduction in potential fire size **% Reduction in crown fire**	The highest reduction in % potential fire size and % of crown fire indicate less severe effects since a more surface fire is expected to burn.	0% 0%	33-40% 39-54%	49-58% 56-70%	15-23% 30-32%	52-58% 59-70%
Probability of stand replacement crown fire. The higher the (-) number the better.	These number show a reduction in fire intensity and severity, extent of fire and undesirable spread.	6-7% Bozeman Creek 8-9% Hyalite Creek	-7% -32%	-22% -32%	-10% -29%	-11% -33%

[1] This estimate is relative to the expected/modeled fire size indicated for this alternative.

Table 2.2: Measures of Fire Behavior, Fire Size and Fire Probability Related to the Purpose and Need for Action. See Fuels Section in Chapter 3 for more detail.						
Measure & Desired Condition	**Outcome**	**Alternative 1 No Action**	**Alternative 2 Proposed Action**	**Alternative 3**	**Alternative 4 Prescribed Burn/No Logging or Roads**	**Alternative 5 Preferred Alternative**
Flame length (FL) **Overall range of flame length.** Lower numbers are desirable.	Lower flame lengths enable effective fire suppression and are indicate a safer environment for firefighters and the public.	0-63 feet	0-27 feet	0-29 feet	0-43 feet	0-19 feet
Average flame length FL of less than 4 foot are most desirable to enable direct effect fire suppression and lower risk to firefighters.		3-5 feet	3-4 feet	2 feet	2 feet	1.5 feet

Table 2.3. Effectiveness of Alternatives Toward meeting the Purpose and Need for Action.					
Purpose and Need Indicator	**Alternative 1 (No Action)**	**Alternative 2 (Proposed Action)**	**Alternative 3**	**Alternative 4 (No Logging/No Roads)**	**Alternative 5 (Preferred)**
Have vegetative and fuel manipulation reduced the potential severity and extent of future wildland fires in the Bozeman and Hyalite watersheds? [2]	Not effective	More effective	Most effective	Less effective	Most effective
Have vegetation and fuel treatments provided for public and firefighter safety by minimizing the probability and effects of future human-caused fire starts and/or helping to reduce the intensity of a potential wildland fire?[3]	Not effective	Less effective	Moderately effective	Less effective	Most effective
Have treatments reduced the potential fire spread to and from adjacent private lands in the wildland, urban interface?[4]	Not effective	Moderately effective	Most effective	Moderately effective	Most effective

[2] Measured by: Fuel model conversion from Fuel Model 10 to FM 184, Probability of stand replacing or mixed severity fire, crown fire potential and reduction of potential fire size.
[3] Measured by: Fuel Model conversion from FM 10 to FM 184, reduction in flame length to 4 feet or less, and reduction in crown fire potential.
[4] Measured by: Fuel Model conversion from FM 10 to FM 184, reduction in crown fire potential, reduction in spotting potential from firebrands associated with crown fire and potential fire size.

Table 2.3. Effectiveness of Alternatives Toward meeting the Purpose and Need for Action.					
Purpose and Need Indicator	**Alternative 1 (No Action)**	**Alternative 2 (Proposed Action)**	**Alternative 3**	**Alternative 4 (No Logging/No Roads)**	**Alternative 5 (Preferred)**
Forest Plan Compliance – Do the proposed treatments meet Forest Plan Standards?	Yes	No [5]	No [6]	Yes	Yes
Does the Alternative address direction in the National Fire Plan (2001)[7]	No	Yes	Yes	Yes	Yes

[5] Proposed treatments do not meet Forest Plan Visual Quality Objectives. (Chapter 3- Scenery)
[6] Visual Quality and Water Quality in Leverich Creek do not Meet Forest Plan Standards.(Chapter 3- Scenery and West Slope Cutthroat trout sections)
[7] See the Fuels Section of Chapter 3.

Table 2.4 Comparison of Issues by Alternative that would be Factors in the Decision					
Issue and Measure[8]	**Alternative 1 No Action**	**Alternative 2 Proposed Action**	**Alternative 3**	**Alternative 4 Prescribed burn/No logging or Roads**	**Alternative 5 Preferred Alternative**
Water Quality [9] **(Projected sediment in % over natural** (The Forest Plan (FP) standard allows no more than 30%) Hyalite Drainage Bozeman Creek Drainage Leverich Drainage	Meets FP Standards in All drainages. 16.5% 12% 2.7%	Meets FP Standards in All drainages. 22.3% 16.4% 29.5%	Does Not Meet FP Standards in All drainages 28.6% 18.6% 35.3	Meets FP Standards in All drainages. 20.6% 16.2% 10.7%	Meets FP Standards in All drainages. 21.9% 17.1% 8.0%

[8] The Fire and Fuels Issue is disclosed in Table 2.2 and 2.3 when comparing the purpose and need for action.

[9] Sediment yield as measured percent over natural in tons/year modeled sediment in Bozeman, Hyalite, and Leverich Creek's is a management indicator for water quality.

Table 2.4 Comparison of Issues by Alternative that would be Factors in the Decision					
Issue and Measure[8]	**Alternative 1 No Action**	**Alternative 2 Proposed Action**	**Alternative 3**	**Alternative 4 Prescribed burn/No logging or Roads**	**Alternative 5 Preferred Alternative**
Westslope Cutthroat Trout Habitat in Leverich Creek[10] Compliance with Forest Plan Standards and the Memorandum of understanding for the Conservation Agreement(MOUCA)	Meets FP Standard Meets the intent of the MOUCA	Meets FP Standard Does not meet the intent of the MOUCA	Does not meet FP standard Does not meet the intent of the MOUCA	Meets FP Standard Meets the intent of the MOUCA	Meets FP Standard Meets the intent of the MOUCA

[10] 1. Percent over Natural (or Reference) Sediment Delivery rates compared to the standard established for Class A streams. Meeting the standard would assure that the 90% spawning habitat management objective is being achieved. (FP standard)

2. Meet the intent of Implementation Strategy for Memorandum of Understanding and Conservation Agreement (MOUCA) for Westslope Cutthroat Trout in Montana by protecting all pure and slightly introgressed (90% or greater purity) westslope cutthroat trout populations and ensuring the long-term persistence of westslope cutthroat within their native range (Powell 2002). Because Leverich Creek is the only project area stream that contains westslope cutthroat trout, this indicator only applies to this watershed.

Table 2.4 Comparison of Issues by Alternative that would be Factors in the Decision					
Issue and Measure[8]	**Alternative 1 No Action**	**Alternative 2 Proposed Action**	**Alternative 3**	**Alternative 4 Prescribed burn/No logging or Roads**	**Alternative 5 Preferred Alternative**
Scenery – Do the treatments meet Forest Plan Visual Quality Objectives (VQO)?[11]	Yes	Yes, except 3 units	Yes, except 9 units	Yes	Yes Treatments would improve the exiting scenery condition near units 13 and 25.
Inventoried Roadless Lands [12] - Do alternatives meet policy and direction?	Yes	Yes	Yes	Yes	Yes

[11] The indicator for measuring potential effects to the scenery resource is the assigned Forest Plan standard for visual quality (Visual Quality Objective) that applies to each area where fuel reduction is being proposed. This is discussed in detail in Chapter 3, in the Scenery section on Applicable Laws, Regulations, Policy and Forest Plan Direction.

[12] The project proposal and its alternatives are reviewed to determine if implementation significantly affects roadless characteristics and meets other criteria established in the 2001 Roadless Area-Final Rule, 36 CFR 294 Subpart B and Forest Service Interim Directive 1920-2006-1

Table 2.4 Comparison of Issues by Alternative that would be Factors in the Decision

Issue and Measure[8]	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4 Prescribed burn/No logging or Roads	Alternative 5 Preferred Alternative
Are wilderness attributes maintained?	No impact	Yes, but there would be short term impact to apparent naturalness.	Yes, but there would be short term impact to apparent naturalness.	Yes, but there would be short term impact to apparent naturalness.	Yes, but there would be short term impacts to apparent naturalness.
Acres of Inventoried Roadless lands that would be impacted.	0 acres 0 acres	600 acres of prescribed burning 350 acres of partial harvest	600 acres of prescribed burning 830 acres of partial harvest	1000 acres of prescribed burning 0 acres of partial harvest	600 acres of prescribed burning 620 acres of partial harvest
Canada Lynx – Would treatments meet the direction in the Northern Rockies Lynx Amendment?[13]	Yes	Yes, with proper documentation.	Yes, with proper documentation.	Yes, with proper documentation.	Yes, with proper documentation.

[13] The standards in the Northern Rockies Lynx Amendment are tied to habitat standards for denning, foraging and amount of unsuitable habitat. These standards and potential impacts are discussed in Chapter 3 in the Canada Lynx section.

Table 2.4 Comparison of Issues by Alternative that would be Factors in the Decision					
Issue and Measure[8]	**Alternative 1 No Action**	**Alternative 2 Proposed Action**	**Alternative 3**	**Alternative 4 Prescribed burn/No logging or Roads**	**Alternative 5 Preferred Alternative**
Northern Goshawk Does the Alternative meet the habitat guidelines?[14]	Not impacted Yes	Least impacted of the action alternatives. Yes	More impacted than action Alternatives 2 & 4. Yes	Less impacted than Alternative 3 & 5 Yes	Most impacted Yes

[14] The Northern Goshawk section in Chapter 3 discusses the potential effects and habitat guidelines in detail.